THE PLANT WORLD.

A MONTHLY JOURNAL OF POPULAR BOTANY.

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THE PLANT WORLD,

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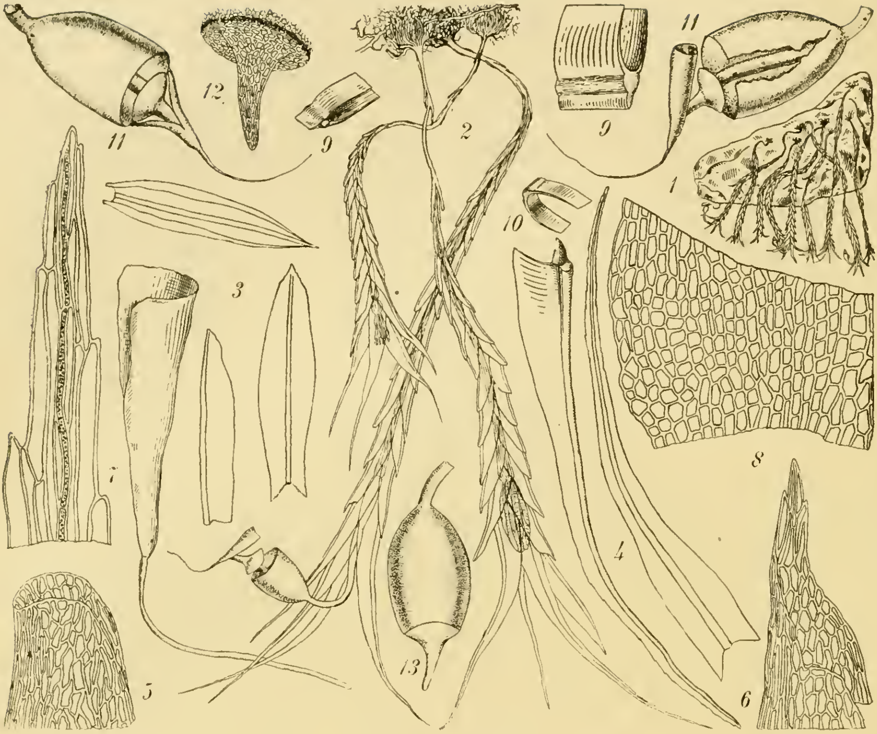
THE SWORD MOSS.

By Elizabeth G. Britton.

IN July, 1883, while traveling with some friends, I first made the acquaintance of this rare moss near Kilbourn City, in the Dells of the Wisconsin river. The rocks are of Potsdam sandstone and are worn away by the swiftly flowing river and its icy current in the winter, into all sorts of fantastic shapes. A short distance up the river, two tributary streams flow into it forming narrow winding ravines which are known locally as "Witches' Gulch" and "Cold Water Canyon." These names but faintly suggest their picturesque character. The rocks are worn away in the greatest diversity of curves and angles, sometimes meeting overhead in a series of broken curves like Moorish arches, and hollowed out below into dark caves, where it is necessary to creep along on narrow planks and climb upon slippery ladders to another basin above. These follow each other in rapid succession and wind around and about. Sometimes the ravine is open and wider and the shelves are covered with rock-tripe and the ledges draped with Polypody. On these shaded ledges along the stream, dripping with moisture, grow ferns and mosses in greatest profusion. Here I found that delicate little fern, *Cystopteris fragilis*, large and abundant, and rarer still, *Pellæa gracilis*. The vertical faces of the crumbling sandstone were hung with sheets of the Sword-moss, its long, twisted, terminal leaves showing where the fruit might be looked for.

The finding of the fruit of this moss was not accidental, for the first day that we visited the Dells I did not know that the fruit had never been collected. But I remembered to have seen an illustration of the plant in the back of my manual (Gray's 5th ed.), and as soon as we returned to the hotel at Kilbourne City that night, I looked it up and was so anxious to search for the fruit that I prevailed on my



THE SWORD MOSS.

good friends, Mr. and Mrs. Rudkin, to go up the river again the next day with me. After diligently searching we found seventeen capsules in perfect condition, all with the lids on and some with the calyptra and its long delicate awn still unharmed. We wrapped each one carefully in tissue paper. I at once sent a specimen to Dr. J. S. Newberry at Columbia College, and he wrote to Lesquereux telling him that the fruit of this rare moss had been found at last. After I had figured and described it I sent him also a specimen. He wrote to

EXPLANATION OF FIGURES.

1.—Plant natural size, showing habit of growth hanging from sandstone rocks.
2.—Three plants enlarged, showing male and female plants and capsule.
3.—Two lower leaves. 4.—Two upper leaves, showing long, slender apex.
5.—Blunt apex of lower leaf.
6.—Acute apex enlarged.
7.—Tapering, serrate tip of leaf from apex of stem.
8.—Base of leaf, showing cells.
9.—Cross-section, showing dorsal lamina projecting from the back of the vein.
10.—Cross-section of one of the lower leaves.
11.—Mature capsule showing part of lid persistent to the columella, and calyptra with the long slender awn.
12.—Lid enlarged. 13.—Capsule with lid on.

me as follows: "If I tell you that I have searched for the fruit of *Phyllogonium Norvegicum* since the first year of my arrival in America in 1847, you will understand how deeply I am obliged to you for the communication of your specimen just received, and how sincerely I am rejoiced to congratulate you for your discovery. I had read two days ago in the *Bulletin* the description of the fruit and seen the figures you have given of it. The last number of the *Revue Bryologique* has the description of a new species of Eustichia fruiting, *E. Savatieri* of Japan which scarcely differs from *E. Norvegica*. As the specimens from which the description is made are too old and deoperculate, the author could say nothing of the peristome. Your specimens are in a perfect state of preservation and prove it to be gymnostomous. This I think will force the removal of the genus into the Pottiaceæ." The specimens reached him in time to insert the description in the galley proofs of his Manual of the Mosses of North America, but the first forms had already been printed, so that in the Analysis of Genera on page 5 it still remained as "*fruit unknown.*" When the Manual was printed he sent me a copy with the following autograph: "To Miss Elizabeth Knight, with the kindest regards of her old unknown friend, Leo Lesquereux." Specimens were also sent to Dr. Asa Gray and Prof. D. C. Eaton, to Messrs. E. A. Rau and S. O. Lindberg, and also to Kew and to Paris, and one went back to its native State, to the University of Wisconsin. Thus began my career as a professional Bryologist.

The Sword-moss was originally discovered by Desvaugh, where and when is uncertain; he sent it to Bridel with the manuscript name "*Fissidens imbricatus.*" Bridel printed a description of it in 1826, but renamed it, placing it in a new genus of his own, Phyllogonium, and supposing it came from Norway, he called it *Norvegicum.* Sullivant, to whom belongs the honor of first finding it in North America, says: "It may be doubted if this rare moss and the tropical *Pterigynandrum fulgens* Hedwig, the type of Phyllogonium of Bridel, are referable to the same genus. A striking dissimilarity—in habit, mode of growth, and in the position of the female flowers which are terminal in the one, but lateral in the other, as well as the structure and reticulation of the leaf, all indicate their separation generically." Bridel must also have doubted its close affinity to his other species of Phyllogonium, for he created a sub-genus for it alone, and wrote its name *Phyllogonium Eustichia Norvegica.* Following Sullivant's suggestion, Bruch and Schimper, in the Bryologia Europea, raised Bridel's sub-genus Eustichia to generic rank, but as the fruit was still unknown could not definitely settle its relationship.

In 1869 Mitten, in his enumeration of all the mosses of tropical America, described some specimens collected by Bourgeau in the Valley of Mexico, calling them *Bryoziphium Norvegicum.* In thus founding a new genus for these specimens he recognized the fact that they were distinct from the other tropical species of Eustichia, and his generic name, Bryoziphium, is the first to separate by themselves these curious, much misnamed mosses.

In 1892 M Bescherelle revised the genus, adopted Mitten's name for it and recognized three species of Bryoziphium, *B. Norvegicum* (Brid.) Mitt., *B. Savatieri* (Husn.) Mitt., and *B. Mexicanum* Besch. I have called attention to the fact in the Bulletin of the Torrey Botanical Club that there still exists an older name for *B Savatieri* as pointed out by Geheeb, and that Berggren described it as *Eustichia Japonica* two years before Husnot named it in honor of its discoverer, so that the same fatality still pursues the members of this cosmopolitan family. How they came to be scattered in such diverse quarters of the globe as Iceland, the United States, Mexico and Japan still remains a mystery, as well as the fact that in spite of producing an abundance of reproductive organs they still fruit so rarely. That this is the case is evident, for Dr. Chas. R. Barnes, and two of his students, Messrs. Cheney and True, searched diligently for the fruit for several years in the same locality where I had found it, and it was not until eleven years afterward that Mr. Cheney was fortunate enough to find it again. I visited the Dells again when the American Association for the Advancement of Science met at Madison in 1893, and was much disappointed not to be able to obtain some fruiting, though we gathered enough of it wherever we saw it growing in fine condition to supply all the readers of this journal who wish to study it.

Perhaps the best description of it is still that originally given by Sullivant:

> "Stems frond-like, flat, mostly simple (about one inch long and one line broad), rooting only at the bulb-like base; leaves two-ranked, complicate, closely imbricating, erect (straight), those on the middle of the stem elongated-oblong, obliquely truncate, shortly acuminate, increasing in size as they ascend; the perichætial leaves attenuated into a long and linear, flexuous, pellucid, flat, equitant, and slightly serrulate point longer than the lamina; areolation above subrotund, below oblong, that of the point of the perichætial leaves linear; costa percurrent, its upper part winged: diœcious; flowers of both kinds terminal."

The description of the fruit is taken from the one originally published by me in the Bulletin of the Torrey Botanical Club, in 1883:—"Capsule terminal, pendent, pyriform 1$^{mm.}$ long and about half as broad when moist, noticeable by its yellow color, supported on a curved pedicel which slightly exceeds the length of the capsule; teeth none: columella a straight rod persistently attached to the operculum which is conic when moist, flattening when dry, bearing the oblique rostrum prominently projecting; calyptra cucullate, .75$^{mm.}$ long, tipped with a long, whip-like awn which equals or exceeds in length the rest of the calyptra."

The following localities are recorded with the date of collection: Columbus, Ohio, W. S. Sullivant, 1841. Lancaster, Ohio, 1849–1850. Distributed by Sullivant and Lesquereux in their Musci Boreali Americani as numbers 109 and 163 from "Lower Ohio and Southern Kentucky" in 1856 and 1865. Dells of the Wisconsin River, Wisconsin E. G. Knight, fruiting, 1883. Ferns, Indiana, L. M. Underwood, 1891. Wisconsin Dells, L. S. Cheney, fruiting, 1894. Lamoille Cave, Minnesota, J. M. Holzinger, 1894.

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

INTRODUCTION.

THE first difficulty encountered by the average beginner in systematic botany lies in the recognition of those groups of plant genera which we call families. Of a species or genus a reasonably clear conception exists, even among those whose knowledge of plants is very slight. Every farmer, for example, knows that clover is a general or generic term for the particular varieties which he distinguishes as white, red, alsike, hop clover, and so on. The various species of oaks or ashes, greatly as they may differ in detail, are always recognizable as oaks or as ashes. But how much stranger it seems when we are told that the clover and the pea or bean belong to one and the same family; or that the larkspur, with its odd blue flowers of most irregular shape, is just as truly a member of the buttercup family as the little yellow buttercup with its five equal petals. The ability to determine a plant, either in the case of the amateur or the trained botanist, depends entirely upon the degree of acquaintance with family characteristics. There are many nearly related families, and a knowledge of each of these will save many a wrestle with a plant, for example, which seems to fit among the mints, having flowers in whorls, tubular corolla and opposite leaves, but which one cannot possibly find described among the labiatæ in any manual. It would have been so easy, with some knowledge of the plant families, to remember that all the mints are distinguished by their peculiar fruit, which is not capsular, like that of our specimen. It then becomes a simple matter to refer the latter to the foxglove family as a species of Pentstemon. In this connection it will be seen how unreliable is the method by which color, for example, is made the leading character for a separation of genera. My aim in this series of papers will be to provide a simple means for distinguishing at sight the more important families among the flowering plants. Once sure of the family, it is not difficult to discover the genus and species with the aid of any good manual. It is to be hoped that knowledge thus acquired and applied in rambles through field and forest may arouse in those for whom these articles are written a desire to understand more of this most charming of the natural sciences.

As the ferns and conifers can be most advantageously studied elsewhere, we shall take up the higher division of the flowering plants, known to botanists as Angiosperms, the name signifying plants which produce their seeds in a closed cavity called the ovary. The Angiosperms are divided into two great sections, each of which may be easily recognized, and which are of such importance that their names and characteristics should be memorized:

1. Monocotyledons. Plants which produce, on germination, a single seed-leaf, or cotyledon. Leaves for the most part with veins running from base to apex, or from midrib to margin, in parallel series. Parts of the flower nearly always in 3's or some multiple of 3. Wood of the stem with no annual rings or layers. Examples: Palm, lily, grasses, sedges.

2. Dicotyledons. Plants which produce, on germination, usually two seed-leaves or cotyledons. Leaves with reticulated or netted veins. Parts of the flower never in 3's, mainly in 4's or 5's, or some multiple of these numbers. Wood of the stem with marked annual rings or layers. Examples: Maple, elm, buttercup, daisy, pea, morning-glory.

The great mass of our northern vegetation, including all the native trees (except conifers) belongs to the second class. The Monocotyledons are the simplest and lowest of all flowering plants; this is proven, not only by their structure, but by the fact that in past geological time they appeared on the earth's surface in advance of the Dicotyledons. With the simplest of the series as our starting point, therefore, we shall visit the ponds and marshes next month in order to study a group of six nearly related families, including the Pondweeds, Arrowheads and Cat-tails.

Mr. F. A. Lucas of the U. S. National Museum, as one of the representatives of the United States in the Fur Seal controversy, is now studying the habits of the seals in the Behring Sea. He will make a collection of plants and will write an article for the Plant World on the floral features of St. Paul's Island.

SENSITIVENESS OF THE SUNDEW.

By F. H. Knowlton

THE insect-catching habits of the delicate little sundew are, since the researches of Darwin, well and widely known. The manner in which these captures are made is very interesting. The leaves are provided on the upper surface with numerous, in some cases several hundred, little hairs, called tentacles, each tipped with a tiny drop of a viscid secretion. The glistening of these drops in the sunlight is what gave rise to the common name of *sundew* for the plants.

Little insects on coming in contact with the gland-tipped tentacles are caught by the sticky secretion and in their struggles to get free excite the tentacle, which immediately begins to bend toward the center of the leaf. Other nearby tentacles are also affected and are soon pressing from all directions against the captured insect, being transformed into a sort of temporary stomach, within the embrace of which the insect is more or less dissolved and absorbed. The tentacles then slowly regain their respective positions.

It was found by experiment that the tentacles could be excited by numerous other substances, some of which—as bits of meat or egg—were dissolved, while others—as pieces of glass and so forth—were rejected. This selective action of the leaves was taken as a guide by Mr. Darwin and many experiments tried with other substances, with the result that various salts of ammonia were found to be most powerful in stimulating movements. The small quantity of some of these necessary to excite movement is truly wonderful. Thus a minute drop containing 1-960 of a grain of carbonate of ammonia placed on the center of the leaf was sufficient to cause the marginal tentacles to become inflected. A tiny drop containing 1-14,400 of a grain when placed on the gland was sufficient to cause that tentacle to move, and so small an amount as 1-268,800 of a grain when absorbed by a gland was found sufficient to cause inflection. With nitrate of ammonia a still smaller amount, namely the 1-691,200 part of a grain, was sufficient to excite each tentacle into movement, and with phosphate of ammonia the results obtained almost pass the bounds of possibility. When a leaf was immersed in a solution of this salt of such strength that each gland could only absorb the 1-19,760,000 of a grain, it was enough to excite the tentacles to movement and even caused the closing of the whole leaf in some instances. That is to say this plant is so exceedingly delicate as to be affected by one nineteen-millionth part of a grain! How far this passes the sensibility of even the most delicately organized animals, can be shown by experiment. A piece of fine hair 1-50 of an inch long and weighing 1-8,197 of a grain cannot be perceived by the human tongue, and it is doubtful if there is a nerve in the body that would note the presence of such a particle when supported in a dense fluid such as that about the tentacles.

FERNS OF THE YOSEMITE AND THE NEIGHBORING SIERRAS.

By S. H. Burnham.

AT the close of the rainy or winter season of 1894 in California, shortly after the closing of Stanford University in May for its summer vacation, I was fortunate enough to be included in a small party of students who were to spend the greater part of their vacation in this world-famed valley, visiting the Mariposa grove of big trees en route. I was with the party seven weeks, and what made the trip more pleasant, we had our own conveyance and camped wherever we wished. The first week was well-nigh spent in journeying down the fertile and fruitful Santa Clara valley, crossing the Inner Coast Range at Pacheco Pass, and then the broad San Joaquin with its muddy river, striking the foothills of the Sierra Nevadas at Raymond in Fresno county.

I found several well-fruited plants of *Pellæa Bridgesii* growing on a rugged rocky ledge, about a mile beyond this little railroad terminus. It is a beautiful fern growing, closely resembling the eastern *P. atropurpurea*, which species I at once took it to be, not being well acquainted with the natural habits of the latter. Among the numerous coriaceous fronds were many brown ones, of at least a year's persistence. If I am not mistaken, the pinnate fronds are greener—"a glaucous green," Underwood says, than in *P atropurpurea* *P. andromedæfolia*, a fern very abundant in rocky places, at least throughout Central California, was found June 20th, near the foot of Nevada Falls, in the valley. Its near relative, *P. Ornithopus*, which often occurs with it, was found in another valley a few miles north of the Yosemite, accessible only by a wild and rugged trail. *P. densa*, whose range extends northward through Oregon, was found on the Yosemite Point trail, June 18th. It grew on moist, mossy rocks of granite, near the foot of the upper cataract of the lofty Yosemite Falls, and was kept green by the ever-changing mist. The altitude was 5,000 feet above the sea, and at the time observed the ovate, densely tripinnate fronds were young, several unrolling daily to view the smiling landscape below. The brownish, scaly, ovate-lanceolate fronds of *Cheilanthes Clevelandii* were also found among the rocks with *Pellæa densa*. New fronds were unrolling daily. Among the tufts of older ones, *C. gracillima* was found in my collection afterwards. It must have been found somewhere between Raymond and the Valley, although the exact locality is not known. My specimen is a tiny one scarcely exceeding three to four inches in height. This fern also grew in crevices of rocks, several fronds springing from the tough, hard root-stock.

Woodwardia radicans, an elegant, luxuriant, semi-tropical fern, was found on the trail to Yosemite Point near *Pellæa densa*, July 2d, at the base of an inclined granite slope, kept green by the flowing of a tiny mountain rill. It was immaturely fruited and dwarfed here, while in the Coast Range it could have been collected at its best. Indeed its natural habitat seems to be in the moist redwood (*Sequoia sempervirens* Endl) ravines, where it is bathed by frequent fogs from the Pacific. In many ravines it predominates, the flattish. erect, pinnate fronds often attaining six to seven feet in height and over two feet in breadth—a fern wilderness. Several fronds are arranged about the same root-stock, and it is often very difficult to find one to press, showing all portions.

Pteris aquilina lanuginosa forms thickets three to four feet in height in many places on the floor of the valley, especially the upper part, during June and July. This fern is equally abundant in the Coast Ranges, and would at first be taken for the species, the principal distinction being that there is more or less silky pubescence on the broad ternate fronds. *Cystopteris fragilis*, a fern with a great range, occurring throughout nearly the whole of the northern and southern hemispheres, was collected three times during the trip, always near water, especially in the vicinity of waterfalls. In the first locality, June 2d, it was found on the rocky banks of the turbulent Merced river, a few miles west of the Mariposa big trees; the second, on the moist rocks on the trail to Yosemite Point, June 18th; and the third, at the mouth of the long, inaccessible canon of the Toulumne river, in the Hetch Hetchy, July 11, where it was kept green by an ever-roaring cataract. It is also found in the Coast Ranges.

Dryopteris munita, a common Californian fern of great beauty, well worthy of cultivation, is abundant throughout the Sierras. It is very chaffy at the base, with light brown, broadly lanceolate scales, which are decidedly acuminate. No specimens were collected here, but the variety *nudata* was collected on the Glacier Point trail, June 20th, at about 5,000 feet altitude. My specimens are from one to two feet in height, and one-half as broad as the type—two and one-half inches. The stipe and rachis without or with but few brown scales, being chaffy at the base; sori generally not fully developed on all the very sharply serrated pinnæ, but remaining small. This variety is a common Yosemite form at this altitude, which undoubtedly has much to do with its transition from the type. *D. rigida arguta* is abundant throughout the valley in rocky places. This common Californian fern closely resembles the various forms of our eastern *D. spinulosa* in general appearance, being about as variable.

In the "fern grotto" near the top of Vernal Falls, June 22d, *Adiantum pedatum* was seen growing luxuriantly in the showers of mist. None could be obtained from the stairway which ascends from the wet, slippery trail below, as it was just out of reach. Once, the beautiful Maidenhair is out of the reach of tourists, although many try to grasp it daily, it is so handsome in this damp grotto where the sun never shines.

Asplenium filix-fœmina, a cosmopolitan species occurring in numberless forms throughout the United States, was found with the Cystopteris in the first two localities given under that species. The fronds were very young, but new fruit had started. In the Coast Ranges it attains its maturity in September, enough nourishment being obtained during the wet season to keep it green during three or four months of the dry.

Selaginella rupestris, a fern-ally of great range, was abundant on the rocky trail to Yosemite Point, June 18th. An *Equisetum*, too immature and meagre for determination, was found in water on Eagle Peak, July 2d, altitude over 8,000 feet. It resembles *E. hiemale* more than any other species, and probably belongs here. This completes the ferns preserved and particularly noted, although the common Californian ferns, viz: *Polypodium vulgare*, *Adiantum emarginatum*, and the handsome *Dryopteris aculeata* must have been seen.

Mr. and Mrs. J. G. Lemmon's list of Yosemite Ferns in Hutching's "In the Heart of the Sierras" is much more complete, and probably too full, as many botanists now think. Since the great influx of tourists to the Valley, many of the delicate ferns and flowers are ruthlessly carried away as mementos, so that the time is not very far distant when the granite walls will be devoid of ferns in accessible places.

SOME SAND-BARREN PLANTS.

By Willard N. Clute.

THE geological forces that shaped Long Island seem to have been quite undecided whether or not to make more than one island of it. At a point toward the eastern end, the Atlantic sends Shinnecock Bay northward, all but meeting that broad sweep of water from the Sound, Great Peconic Bay, and is only prevented from cutting the island in two by a narrow strip of sand dunes called the Shinnecock Hills. To those who are only familiar with the luxuriant vegetation of an inland flora this region is likely to be one of peculiar interest; not because of its varied forms, but rather from the very paucity of them. Any one interested in the distribution of plants and the means employed by them to exist under adverse conditions, could find few better opportunities for study than are here presented.

I doubt if there is any other place within a hundred miles of New York City where so much of the desolate is crowded into the landscape. On every side, as far as the eye can reach, the yellowish-white sand stretches away in a sterile, uncultivated, sun-burned, wind-swept, treeless waste. The surface is a succession of swells and hollows—like that of its neighbor the sea—and the larger eminences could suggest hills only to the most vivid imagination.

The first thing to attract the notice of a visitor from a more fertile region is the fact that the vegetation is so scanty that the soil actually shows through it; often there are considerable areas in which absolutely nothing grows. Much, however, that at a distance appears bare and gray, is found upon closer inspection to be covered with lichens—the reindeer-moss (*Cladonia*) principally. While in large patches *Cladonia* is sole tenant of the soil, other plants have their special domain also. It is remarkable how the various plants tend to grow in masses of one kind, as if Nature was here trying her hand at gardening and had assembled each species into a bed of its own.

Inland, the sweet-fern delights in dry and sterile hillsides, but here the soil is not always to its liking. It grows only in the more fertile portions, and then seldom attains its usual size. Its cousin, the bay-berry or wax-myrtle, is found throughout in scattered clumps, the cool dark-green of its foliage seeming to promise shade and rest; but this is only an enchantment fostered by distance, for the tallest branches do not reach as high as a man's head. In these sandy places one looks in vain for the sun-loving bracken—probably it gave up the struggle long ago.

It is not until one has walked for some distance across this moor, that he realizes how very few species occur upon it. He is also likely to be surprised at the great variety of color that meets the eye, until he observes that this is due to each species growing by itself. In August there are patches, here and there, one solid blaze of yellow, produced by the golden aster (*Chrysopsis falcata*). It is a low, straggling herb growing in tufts, and clothed thickly with hairs to prevent the evaporation of the little moisture it manages to suck up during a rain. On the next hillock one may notice a great black shadow as if the scant vegetation had lately been burned over, but as he approaches the black changes to gray and then to sage-green as he finds himself in the midst of a tiny thicket of the heath-like *Hudsonia tomentosa*. Only the upper branches are living, and one must look straight down upon it to get much of a glint of green. This is even more densely clothed with wool than the golden aster, and treasures its hoard of water as a miser does his gold.

The word, heath, is used in some sections to denote barrens of this kind, because of the number of heath-worts that grow upon them. Here it would be a misnomer, for it is only occasionally that one comes upon a single representative of the race in the Bear-berry (*Arctostaphyllos Uva-ursi*). Where it occurs it grows in broad patches, the glossy-green leaves and bright red berries a beautiful sight in a weary land—but a beautiful sight only. Bite into one of the berries—ashes! No plant with such an abundant crop of berries could put any juice into them in this dry land. Its roundish leaves are thick and glossy, in this way protecting the little moisture in them. Small wonder, then, that its fruit has gained the name of meal-berry.

The foregoing are the principal plants of the Shinnecock Hills, but it is not to be supposed that they are the only ones; on the contrary many others are found and often make a considerable showing by their numbers, especially the dwarf sumac, beach plum, running blackberry, narrow-leaved boneset (*Eupatorium hyssopifolium*), the heath aster (*A. ericoides*), narrow-leaved goldenrod (*Euthamia Caroliniana*) and the prickly pear (*Opuntia*). Doubtless a persistent search would reveal a fairly large flora, in studying which the botanist may find both pleasure and profit.

At the present time the Bread-Fruit Trees (Artocarpus) are not found native in the New World, being confined to tropical Asia and the Malay Archipelago. In comparatively recent geological time however, they were present in North America, as no less than three species have been described. One, with a portion of a typical "bread-fruit" attached, was found in Greenland, another near Denver, Colorado, and the third in California.

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THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

Articles and Notes on any subject of interest to plant-lovers are solicited, and should be addressed to the editor.

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In presenting a new journal for the consideration of the public it is necessary to explain some of the reasons for its being, to outline its scope and policy, and to state what, it is confidently hoped, it may accomplish. That there has been a great awakening in recent years of popular interest in plants and plant-life, can not be denied. From the study of botany, which was regarded as an accomplishment to be compared with music or a modern language, the study of the vegetable kingdom has come to be a part of every liberal education, beginning with the primary grades, and reaching to and beyond the university. With this increase of attention it is but natural that many additions should have been made to our knowledge of plant-life, but much of this information is still locked up in the more or less technical language of science. The chosen field of this journal will be to divest this language of its technicality, and to present the facts in readable form, but without the sacrifice of scientific accuracy. It will therefore be intermediate between the numerous strictly technical journals and the minor publications.

In this broad intermediate field, which is now practically unfilled, it is hoped to make the PLANT WORLD widely useful. It will contain articles that will be helpful and stimulating to the young or isolated student. It will also embrace matter of value and interest to students and teachers of botany in the public schools, such as directions for the preparation of material for study, outlines for the study of difficult plant-groups, reviews of literature and seasonable hints and information. The professional botanist will likewise find subjects and information of interest. But above all the journal will have in mind the needs of that large and growing class of readers who are interested in plants and plant-phenomena, but who have no time or inclination to undertake a systematic course of study in botany. It will aim to interest as well as instruct.

The journal will not be the organ of any society, nor for the advancement of any particular school of botany, but will be as broad in its scope as the broadest conception of the vegetable kingdom. Every one will be welcome to representation in its pages, and to the end that it may attain the maximum of usefulness, it is earnestly requested that any one who has an interesting or curious bit of information along the above lines, will not fail to send it to the editor. What has interested and instructed you may interest and aid others.

The plan for a journal of this character was formulated by the editor in 1895, and an outline presented before the Botanical Club of the American Association for the Advancement of Science at the Buffalo meeting. It was not deemed expedient for the Club to adopt an official organ, and maturer judgment has approved the wisdom of this course, both from the standpoint of the Club and of the journal, therefore, as indicated above, the journal will be thoroughly independent. That there is a field for a journal of this character is attested, not only by the well-known botanists and investigators who have generously consented to assist in its management, but by expressions of warm approval or promises of assistance from many distinguished students and writers throughout the country.

.... NOTES AND NEWS.....

The British Isles have only a single native oak (*Quercus Robur*), while the District of Columbia has not less than nineteen species, and an unknown number of hybrids.

In the recently issued fascicle of Richter's *Plantæ Europææ*, which is being continued by Dr. Gurke, there are enumerated as natives of Europe no less than 226 species, varieties, or named and recognizable hybrids of the genus Salix (Willows).

Mr. F. V. Coville, botanist of the Department of Agriculture, has just issued as a contribution from the National Herbarium, an interesting account of the plants used by the Klamath Indians of Oregon. No less than eighty-eight species are used by them, either as food or in their home life. For the convenience of students of ethnology Mr. Coville has given an alphabetical list of the Indian names of these plants, with the scientific equivalent.

Mr. J. B. Hatcher of Princeton University has recently returned from an eighteen months' collecting expedition in the extreme southern portion of South America. The primary object of his visit was the collecting of vertebrate fossils, and of these he obtained some eight tons, but he also collected plants and other objects of natural history. He reports having made a very complete collection of the mosses and hepatics of Terra del Fuego and the neighboring mainland of Patagonia.

Mr. David White of the U. S. Geological Survey, and Mr. Charles Schuchert of the U. S. National Museum, have accompanied Lieutenant Peary on his Arctic expedition. They sailed from Boston July 18th, and expect to return about October 1st. They will be landed on the west coast of Greenland in the vicinity of Disco Island and the Noursook Peninsula, and the object of their visit will be to secure for the National Museum a collection of fossil plants, which are known to be abundant at this point. They will also collect living plants, and Mr. White has promised an article on botanizing within the Arctic Circle.

While spending a few days collecting in the eastern part of Long Island last August, I was fortunate enough to find a quantity of *Kneiffia Alleni* near Southampton. This plant has been reported only from eastern Long Island, and the station where I found it is some distance farther west than any before noted. The plant was in full bloom, the blossom looking much like that of the common evening primrose, to which it is closely related. It is commonly called "sun-drops." In habit the plant is generally supposed to be ascending or almost trailing; many that I found were quite low, but plants were not wanting that were eighteen inches high, and almost erect. In a swamp near the coast, I also found an abundance of *Coreopsis rosea*, which the 6th edition of Gray's Manual marks rare from Massachusetts to New Jersey, in grassy swamps. It was found in standing water and in appearance quite resembled the common robin's plantain or fleabane. The rays were rose-purple, a color seldom adopted by plants of its genus.—*Willard N. Clute, Columbia Univ., N. Y.*

In the 6th edition of Gray's Manual of Botany *Euphorbia Nicæensis* is mentioned as being a rare escape at Binghamton, N. Y. This statement is based upon Mr. C. F. Millpaugh's find, and was supposed to be the only station in the United States, although it undoubtedly occurred at that time and years before at other places along the Susquehanna valley, and should have been included in previous editions of the Manual. I find this plant along the Susquehanna river for a distance of thirty miles, at the following stations: Union, Vestal, Apalachin, Campville, Smithboro, Barton and west of Barton. At Barton it is abundant along roadsides, waste places, and in fields for a distance of half a mile from the village, and is considered by the residents as a vile weed which it is impossible to exterminate. An old gentleman informed me that it has been established on his farm for at least twenty-five years, and that he has tried all means known to him to destroy it, but it only thrived the better. This spurge was introduced into this country from the Old World, and has escaped mainly in villages, and does not seem to have spread much beyond their limits. It is a tall, stout and glabrous perennial, with running root-stalks, growing in dense patches to the exclusion of all other vegetation, and when once established is almost impossible to eradicate.—*Frank E. Fenno*, *Apalachin*, *N. Y.*

On August 1st of this year, while walking along the border of a swamp in Laurel, Prince George's county, Maryland, my attention was attracted to a remarkable lily, which stood out boldly among numerous examples of the common Turk's-cap lily (*Lilium superbum*). The stems were between seven and eight feet tall, and fully a foot higher than any of the Turk's-caps growing around them. The flowers were a *clear lemon yellow without spots*, but with a large, bright green, triangular area at the base of each perianth-segment. On drying the flowers, very faint spots came out on the segments, thus probably showing its near relationship to the Turk's-cap. The leaves are similar to those of the common form, being perhaps more scattered above, and the flowers are similar in size and shape, but the effect was very striking when they were compared with orange-red, profusely spotted flowers among which they grew. I was informed by a resident of Laurel, who has been familiar with the locality in which they grew for twenty years, that this yellow lily has been observed by him for many years, and although not abundant, could almost always be found near by. The plants have been carefully marked, and when the bulbs are matured they will be removed and propagated, and if they retain this peculiarity, will doubtless prove to be a new species. Have any of our readers ever noticed this yellow lily? Has any one observed a yellow, unspotted form of the Turk's-cap lily?—*F. H. Knowlton.*

AMOS EATON.

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THE PLANT WORLD,

A MONTHLY JOURNAL OF POPULAR BOTANY.

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SOME EARLY AMERICAN BOTANISTS.

AMOS EATON.

By F. H. Knowlton.

PROFESSOR AMOS EATON, who has been selected as the subject for the first of a proposed series of short articles on some of the pioneers in American botany, is believed to have been the first to attempt the popularization of botany in the United States. It therefore seems especially fitting that an early number of this journal, which is to be conducted along similar popular lines, should contain some account of his life and work.

Amos Eaton was born in Chatham, Columbia county, New York, May 17, 1776, and died at Troy, N. Y., May 6, 1842. His family was descended from one John Eaton, who came from Dover, England, about 1635, and who settled in Dedham, Mass. His father, Captain Able Eaton, was a successful farmer, and it is probable that the early life on the farm did much to shape the later course and interests of the young naturalist.

He graduated from Williams College in 1799, having taken it is said, a high standing in science. He decided, however, on the legal profession, and studied law in Spencertown and New York City, and was in due course admitted to the bar of the Superior Court of New York. While in New York he became acquainted with and was much influenced by Dr. David Hosack and Dr. Samuel L. Mitchill, the most distinguished scientific men in the city at the time. After admission to the bar he settled in Catskill, and here it was, in 1810, that he gave what was probably the first course of popular lectures on botany in this country. In this same year he published his *Elementary Treatise on Botany.*

As his interest in the natural sciences increased, his taste for the law diminished, and finally in 1815 he abandoned it altogether, and removed to New Haven, where he studied under Prof. Silliman. After taking courses in chemistry, geology and mineralogy he took up his residence near Williams College, where he gave volunteer courses of lectures to the students on botany, geology and mineralogy. Here in 1817 he published the first edition of his *Manual of Botany.* The field of these lectures was gradually extended to include the principal towns in New England and New York, and were everywhere received with enthusiasm. He possessed "an easy flow of language, a popular address, and a generous enthusiasm in matters of science, which easily communicated itself to his pupils," and as a result of his labors there sprang up 'an army of botanists and geologists.'

Professor Eaton was among the first to study with his classes in the field. In his geological survey of certain counties in New York, he inaugurated the system of geological survey in this country. He also published a number of geological text-books in this at that time little worked field.

In 1824 he was placed at the head of the School of Science founded by Stephen Van Rensselaer at Troy, N. Y., and here he passed the remainder of his days. This institution, now known as the Rensselaer Polytechnic Institute, owes much to Professor Eaton. He introduced and developed the system of instruction by means of lectures and experiments conducted by the students themselves, and various other reforms.

Professor Eaton's botanical works were as follows: *Botanical Dictionary*, 1817; *Botanical Exercises*, 1820; *Botanical Grammar and Dictionary*, 1828. The *Manual of Botany* passed through eight editions, the final one appearing in 1840, with the colaboration of Dr. John Wright. It contains descriptions of some 5986 species of plants and did much to stimulate the study of systematic botany in North America.

A word may be said of his personality;—He is described by Professor Albert Hopkins of Williams College as "of striking personage, a large form, somewhat portly and dignified, though free from what is commonly called *starch.* His face was highly intellectual, the forehead high and somewhat retreating, locality strongly marked, and the organs of observation and comparison well developed. His hair was black, and, being combed back, rendered his fine physiognomy still more striking." The fine portrait which we are able to present is by the kindness of his great-grandson, Mr. George Francis Eaton, of New Haven, Conn. It is from the original steel engraving by Richey of Boston. The main facts in this article have been derived from the sketch of Professor Eaton in the *Popular Science Monthly* for November, 1890.

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

II. THE CAT-TAILS, PONDWEEDS AND ARROWHEADS.

THERE are few of us, I fancy, who are not familiar with the wand-like, brown spike and sword-shaped leaves of the Cat-tail. Its presence always indicates a marsh or swamp wherein the explorer is likely to find himself beyond his depth if he ventures to penetrate far in his efforts to gather a supply of "tails." The Cat-tail family (*Typhaceæ*) contains but a single genus, and is therefore easily recognized. The spike consists of innumerable tiny flowers, reduced to mere stamens and pistils, with no perianth or floral envelope, but with numerous intermixed bristles. The upper portion of the spike, at flowering time, is lighter in color and less dense; this is composed entirely of stamens, which soon fall away, leaving the pistils below to form a cotton-like mass in fruit. The genus is widely distributed in temperate regions.

The Bur-reed family (*Sparganiaceæ*), also including one genus, *Sparganium*, was formerly included with the Cat-tails. The plants possess, however, an entirely different aspect, and grow in wet, grassy places or even in deep water, but not in dense colonies like *Typha*. Here the staminate and pistillate flowers are likewise separate, but are borne in several globular heads on the upper branches of the stem, and not in a single terminal spike. The fruit is hard and nut-like, much larger than that of the Cat-tail, and without any intermixed bristles; while the leaves are long and grass-like.

The Pondweeds (*Naiadaceæ*) constitute a large and difficult family. The genera are few in number, and the great majority of species are comprised in *Potamogeton*, which is very appropriately translated as "River-weed." Slow streams and rather shallow ponds are the favorite habitat of these plants, whose smooth, oval leaves floating on the surface of the water, may be noticed in many such situations. Nearly all our American Potamogetons occur in New England and the Middle States. It is not necessary to enumerate the remaining nine genera of the family, as they agree in having the flowers with a distinct perianth, or envelope of four parts; in this respect they are somewhat anomalous among the Monocotyledons, which will be remembered as having the parts of the flower mostly in threes. All the Naiads are immersed aquatics, with branching stems, and the flowers in small spikes. The submerged leaves often differ curiously in shape from those that float on the surface. The pistils become in fruit usually small, one-seeded nutlets, often curiously crested or ridged. There is little satisfaction in collecting these aquatics, unless one can spare time to float each plant out carefully upon a sheet of white paper, when they are, indeed, beautiful objects for study.

The Arrowheads (*Alismaceæ*) are distinguished from the preceding families which we have examined by having in the majority of cases a manifest white perianth surrounding the stamens and pistils. In *Alisma*, the water-plantain, this is small; but in *Sagittaria* and its allies the three white petals are large and of the texture of crèpe, so that a bog full of these plants presents a beautiful sight in the sunlight with their spikes of delicate flowers and arrow- or halberd-like leaves. From sad experience one will learn the futility of attempting to gather a bouquet of Arrowheads. There are about a dozen genera in this family, and over sixty species, the bulk of them occurring in the deep swamps of tropical regions. The leaves are entirely basal, not produced along the stem as in the Pondweeds; and the flowers are borne in loose clusters or panicles, not in close spikes, with their parts in threes; they are sometimes perfect, but more often the staminate and pistillate flowers are separate on the same plant, which is expressed by the term *monœcious* in botany.

One little family, chiefly exotic, contains the well-known "tape-grass" or "eel-grass" of fresh and brackish waters, the long, ribbon-like strands of which are often seen cast up along the shore, and form the chief food of the wild ducks in the Chesapeake Bay. This plant, *Vallisneria*, illustrates the characters of the *Vallisneriaceæ*, or Tape-grass family, in being a submerged aquatic with flowers having an inconspicuous perianth, the staminate and pistillate chiefly borne on separate plants (diœcious). The fruit, as in most of these water-weeds, is nut-like.

In the next article we will attempt to distinguish between the grasses, sedges and rushes.

Earle, in a charming little volume on "English Plant Names," has the following to say in regard to the study of the vernacular or common names of plants: "The fascination of plant names has its foundation in two instincts, love of Nature, and curiosity about Language. Plant names are often of the highest antiquity, and more or less common to the whole stream of related nations. Could we penetrate to the original suggestive idea that called forth the name, it would bring valuable information about the first openings of the human mind towards Nature; and the merest dream of such discovery invests with a strange charm the words that could tell, if we could understand, so much of the forgotten infancy of the human race."

TWO BOTANISTS IN NEW MEXICO.

By A. A. Heller.

ONE day last winter while looking up the literature of a certain group of plants, I came across the statement concerning a newly described species, "that its home will be found among the mountains back of Santa Fe, a region examined by Fendler a half century ago, and totally neglected since his day."

As the Southwest is a region of great botanical interest, the assurance that this particular region has not had its botanical harvest reaped during the past fifty years, decided me to spend the summer vacation there. Accordingly, early in May, Mrs. Heller and myself started for the historic old town of Santa Fe, where we spent nine weeks exploring the surrounding country within a radius of fifteen miles, although several trips were made to points much more distant.

Santa Fe lies in a shallow valley just below the point where the creek of the same name cuts its way through the mountains, and has an elevation of 7,200 feet. Northeast and east of the town are several peaks which rise almost 5,000 feet higher, among which are "Baldy" and "Lake Peak." Somewhere near the summit of the latter are several small lakes, where Santa Fe creek rises. From these peaks the mountains rapidly decrease in size, and end fourteen miles southeast of Santa Fe. They are clothed with a scattered, stunted growth of conifers, and at some places with oak and poplars. As a rule they are barren and do not afford good collecting ground, except in a few places where small streams trickle down.

South and southwest of the town stretches an almost level plain, bounded by a region of cinder cones and "blow outs" on the west, and on the south by mesa land. It is not good botanizing ground, harboring nothing but a few species of cacti and a monotonous growth of several species of Compositæ. On the north and west, extending to the Rio Grande river, a distance of from eighteen to thirty miles, is a succession of low, gravelly hills, the home of an interesting and varied flora. The arborescent growth on these hills is represented by two species of conifers, the Nut Pine or Pinon, here a low, spreading bush, rarely over six feet in height, and a shrub Juniper. Both of these trees are the hosts of parasites, two species of Mistletoe, and each unwelcome guest appears to stick religiously to its own particular host, although the two species of trees often grow side by side.

In the open spaces between the scattered conifers, were blooming several showy species, some of the first spring flowers. One was

Ptilepida argentea (A. Gray), formerly *Actinella argentea* A. Gray, Mem. Am. Acad. (II) 4: 100. 1849. It is a beautiful plant, with large yellow flowers, and silvery, canescent leaves. It is also found well up on the mountain sides east of the town. *Pentstemon Fendleri* occurred at intervals, and appears to grow only on these hills. It is a low plant, rarely over fifteen inches high, and bears beautiful blue-purple flowers. Of late years it has been confused with a very different plant whose home is in the far Northwest.

Two species of *Astragalus*, *A. cyaneus* and *A. diphysus*, were rather plentiful. Both were originally described from specimens collected on these hills by Fendler. The flowers are purplish, and the latter species has bladdery, curved pods, mottled with purple.

Everywhere, clinging closely to the ground, were showy, yellow-flowered plants of *Lesquerella intermedia* (S. Wats.), (*Lesquerella alpina*, var. *intermedia* S. Wats. Syn. Fl. N. Am. **1**: Pt. 1, Fasc. 1, 117. 1895). It differs from *L. alpina* of the northern Rocky Mountains, in having a stouter stem, broader and blunter leaves, and larger flowers. The petals are also narrower, and the pods are of a different shape, being rounded and blunt, instead of pointed.

Another plant found only on these hills, is *Linum puberulum* (Engelm.), (*Linum rigidum*, var. *puberulum* Engelm. Pl. Wright. **1**: 25. 1852.) It is a small plant as a rule, branched from the base, has entire leaves, no involucral leaves below the calyx, the flowers are almost copper-colored, with a darker center, and are rather small for the group to which it belongs. The seed pods are also small.

Several species of Evening Primroses flourished in suitable situations. One of these, *Anogra albicaulis*, was very plentiful on grassy slopes, making a very pretty showing with its large white flowers. They open in the evening and close early the next forenoon, although on cool, cloudy days some belated blossoms can be found as late as eleven o'clock. The above are only a few examples of the early spring flowers, which day by day give way to others "too numerous to mention."

Of the summer bloomers, the most abundant one, clothing the hills and plain with its wealth of golden blossoms, was *Ptilepida floribunda* (A. Gray), (*Actinella Richardsonii*, var. *floribunda* A. Gray, Mem. Am. Acad. (II) 4: 101. 1849.) This species has a more extended range than the majority of the others mentioned, as it also occurs in Colorado and Utah, but the original specimen was collected at Santa Fe by Fendler. It is much taller and more branching than the plant to which it was first referred as a variety, the branches forming a broad fastigiate cyme, with smaller flowers. There are several other distinguishing characters which are constant.

Members of the Goosefoot family are not wanting either, some of them introduced and others native. Among the latter is *Chenopodium incanum* (S. Wats.), (*Chenopodium Fremontii*, var. *incanum* S. Wats., Proc. Am. Acad. **9**: 94. 1874.) That this well-marked species should have been referred to Fremont's Goosefoot seems rather hard to believe after one becomes acquainted with the two plants, for they are totally unlike in appearance and habit. Our plant is low, spreading, more branching, has smaller, thick leaves, whitened beneath, in contrast with the other species, which is tall, erect, and has light green, thin leaves.

Perhaps the most interesting find of the season was the re-discovery of *Monarda pectinata* Nutt. This species was originally collected near Santa Fe by Gambel, and has been almost unknown since. Fendler also collected it under No. 602, but Dr. Gray apparently did not recognize it as belonging to Nuttall's species, as he makes no mention of it in the Synoptical Flora. Along the road between Santa Fe and Canoncito it is very abundant, and scattered plants were also seen near the Rio Grande. Although the collection will yield a dozen or more new species, not one of these occupies such a prominent place in our botanical affection as does this rare *Monarda*.

In the report on the Fendler collection, the valley on the Santa Fe creek is said to have been the most prolific ground, but I did not find it so. For a distance of nine miles the valley is rather bare and unproductive of species, due no doubt in part to the ravages of the omnipresent goat. Only when one follows the stream to the neighborhood of "Monument Rock," will he find prolific ground. Here are located several small ranches, and within their bounds many fine species flourish unmolested in the meadows. Here, on the banks of the stream was found *Hydrophyllum Fendleri* (A. Gray), (*Hydrophyllum occidentale*, var. *Fendleri* A. Gray, Proc. Am. Acad. **10**: 314. 1875), which differs in several particulars from the Western Water-leaf, a native of Oregon and northwestern California. One of its near neighbors was *Pentstemon Torreyi*, or "Bloody Noses," as it is sometimes called. It is an inhabitant of dry banks and hillsides in open woods, and is a beautiful sight when the long, scarlet flowers are fully open.

Here, too, but only on the mountain sides, and mainly on the ridge on the right bank of the stream, are numberless bushes of the small-leaved Mock Orange, *Philadelphus microphyllus*, lading the air with its sweet perfume. The type specimen was also collected here. Another pretty plant, with bright yellow flowers, twisted pods, and prominent style is *Draba stylosa* (A. Gray), (*Draba aurea*, var. *stylosa* A. Gray, Amer. Journ. Sci. (II), **33**: 243. 1862.) It grows equally well in the low ground in the valley, and on the ridges.

To enumerate all of the rare or beautiful species and to point out their peculiarities, would require many pages, and must be reserved for a full report at some future day. Apart from the hills north and west of the town, the best collecting ground appears to be located on the hills to the southwest, along the road leading to Glorietta.

Altogether, the collection of 350 numbers is the best we have ever made in America, for among them are some fifty species collected at the same places where Fendler collected the types of his new species, thus making ours authentic specimens of those types.

Although some of the roads are rough and full of sand in places, this, my first season's experience with a bicycle, proved it to be an invaluable assistant. With it I was enabled to carry a heavy portfolio, make round trips of from thirty to fifty miles in a day, and yet get back in time to put my plants to press the same day, all with less discomfort and fatigue than if a distance of ten or fifteen miles had been covered on foot.

We found that New Mexico, though not such a prolific field as many other parts of the country, yields a rich harvest of rare and interesting plants, and we hope to again revisit the Territory in the near future.

University of Minnesota, Minneapolis, Minn.

THE OLD FIELD PINE IN NEW JERSEY.

By Arthur Hollick.

UNTIL very recently the geographical range of the Old Field Pine (*P. Tæda* L.) was thought to be limited on the north and east by Delaware Bay. In *Garden and Forest* for May 19, 1897, however, Mr. Gifford Pinchot noted the occurrence of a single tree at Town Bank, Cape May county, N. J. This, so far as I can ascertain, is the first record of the species in New Jersey. In *The Forester* for June, 1897, its occurrence there, independent of cultivation, was rather questioned by the editor, and it became a matter of interest to determine if possible whether the species was native in the locality and whether other specimens were to be found there.

Shorlty afterwards I received a communication from Professor John C. Smock, State Geologist, requesting me to go to Cape May and investigate the matter, and I was referred to Mr. Nathan C. Price of Cape May City, who was supposed to know the location of the individual tree reported by Mr. Pinchot. I arrived there on Aug. 5th and found Mr. Price, but he knew nothing about *Pinus Tæda* as a species or Mr. Pinchot's tree as an individual, and as I had not, at that time, read the article in *Garden and Forest* describing the locality, I was nonplussed. The outlook for finding one individual tree somewhere in Cape May county seemed very dubious; but on the following day Mr. Price drove me around the region and I maintained a sharp watch for any long-leaved pines. We finally left the road at Cold Spring school-house and entered a patch of woodland by means of a well-defined wagon track. The trees were mostly *Quercus alba*, *Q. ilicifolia*, *Q. digitata*, *Q. Phellos* and *Q. rubra*, with scattered trees of *Pinus Virginiana* and *P. rigida*, and a typical pine barren undergrowth. The first pine met with on the edge of the woods at once attracted my attention and it proved to be a thrifty *P. Tæda*, some thirty-five feet tall, whose status as a native could no more be doubted than could that of any other tree in the woodland. The search was then continued through many miles of deciduous and pine woods, and although hundreds of other pines with long needles were seen and scores of them were closely examined, they all proved to be *P. rigida*.

The interesting question then arose whether I had by good luck found Mr. Pinchot's tree, or whether I had found another specimen. Subsequent communication between us assures the fact that two trees have been located, quite a distance apart, and leads to the inference that these are not the only ones in the vicinity. In the meantime we may safely add *P. Tæda* to the native flora of New Jersey.

While on a botanical trip towards the end of July, near Baltimore, Md., we came across six or eight well-developed capsules of the Virginian snake-root (*Aristolochia Serpentaria*). It seems that this plant seldom fruits, so that our find may be considered a good one. At Loch Raven, near Baltimore, this species is quite plentiful, growing in pine woods, and in one place on some rocky ledges with no great supply of soil. It was from the plants in the latter situation that the capsules were obtained. Not knowing their rarity we did not search very carefully for them, but simply examined one or two of them and saved four or five to show to botanical friends at home. As well as we can remember there were two or three capsules left on the plants. One of the countrymen who first showed me the plant in the pine woods, pointed out that the tops of nearly all of them had been eaten off. The only explanation he could offer was that some wild animal sought it out for medicinal purposes, a fact no more surprising than a dog's eating grass when unwell. No cattle or horses run in these woods, and there is too little undergrowth to attract them. The snake-root seemed to be the only plant injured. The countrymen steep the roots in whiskey and take the concoction for colds.—*C. E. Waters*, *Johns Hopkins University*, *Baltimore*, *Md.*

HOW PLANTS FLEE FROM THEIR ENEMIES:

SOME REASONS FOR PLANT MIGRATIONS.*

By W. J. Beal.

IN managing a small botanic garden for the past twenty years, my attention has often been forcibly called to many peculiarities of plant growth. An attempt has been made to grow well in suitable spots in the open air over 2,000 species of hardy plants. These plants were collected in Michigan and elsewhere, from woods, river bottoms, marshes, swamps, open fields where the soil was wet, dry, loam, muck, sand or clay. Considerable knowledge has been gained in person by digging plants in their native haunts and by transferring them at different seasons of the year from one portion of the garden to another.

Many years ago I started out with the thought somewhat vaguely fixed in mind that I might find a spot congenial to each species and there plant a patch of it and it would thrive for all time to come, or at least for my time. Most of the plants started well and thrived remarkably in their new homes which I had selected, but after two to six years or longer, many of them began to show signs of failing or died outright, notwithstanding all other species of higher plants in each case were diligently kept from intruding, and usually some fertilizers were employed. Neither were the plants in the patches allowed to crowd very closely, for they were thinned as occasion seemed to require.

I learned long since that there is no such thing as planting once for all time. There is no such thing as stability, for plants need a change sooner or later and will have it or perish.

After a few years plants of the mint family of thirty to sixty species began in numerous cases to show lack of thrift. The ground was clogged with thick mats of rootstocks starving for more room. They were thinned, but still they dwindled. A number were affected with rust and others with fungi, and numerous insects had learned where to find them—in fact, seemed to have settled down to live in that bed of plants. The following plants, especially, failed or died in the middle of each plot, and the healthier portions were to be seen about the margins where rootstocks had encroached on new soil:

Glecoma hederacea, *Lycopus sinuatus*, *Lycopus Virginicus*, *Mentha Canadensis*, *Monarda didyma*, *Nepeta Cataria*, *Vleckia nepetoides.*

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*[*Read at the meeting of A. A. A. S., held in Detroit, August, 1897.*]

The plot of wild asters and goldenrods in like manner has recently suffered much from certain insects working at the roots, at well as at at the tops, and several parasitic fungi have injured some of them. Insecticides have been employed, still, from one cause or another, after a few years, several species have been lost. In some instances it appeared to be due to unfavorable weather.

A number of species of sunflowers (*Helianthus*) were nearly destroyed by rust and mildew, and some patches became nearly extinct, where the roots had slowly fed over the ground. A thrifty piece of iron-weed (*Vernonia*) five or six feet in diameter nearly all died last year, as a hint that a new place was needed. A little on the spreading margin was left alive.

After growing four years in nearly the same place, a thrifty piece of *Euphorbia dentata*, an annual brought from central Indiana, all succumbed to a rust, and *Euphorbia nutans* is likely to do likewise. I will say that I have lately found a couple of healthy plants of *Euphorbia dentata* near where the patch was located several years ago, and healthy plants of *Euphorbia nutans* can be found in isolated places.

I have within twenty years seen numerous patches of shepherd's purse become nearly extinct on account of attacks of *Cystopus candidus*, and patches of knot grass nearly exterminated by rust. In some of these localities a new crop, after a few years, sprang up where the ground had been plowed.

Where things have gone on in a rather monotonous way for some years, certain insects settle down, live and thrive; meadow mice, moles, squirrels, rabbits, muskrats—all learn the way, and the longer a plant remains in one place in considerable quantity the more it is likely to be disturbed by some of these enemies. As previously observed, the same may be said of all sorts of rusts, mildews, microbes and the like.

In mellow soil, such as the following plants delight in, the rootstocks (in a few, the roots) run rampant in every direction, encroaching on other plants and producing a mixture of species sometimes difficult to untangle. Most of them are the pest of gardeners. Here are some thirty-six of them:

Agropyron repens, *Apios* (*tuberosa*) *Apios*, *Apocynum cannabinum*, *Aristolochia Clematitis*, *Asclepias Sullivantii*, *Asclepias Syriaca*, *Bocconia cordata*, *Capriola* (*Cynodon*) *Dactylon*, *Carduus* (*Cnicus*) *arvensis*, *Carex riparia*, *Carex trichocarpa*, *Convolvulus Sepium*, *Coronilla varia*, *Cyperus rotundus*, *Linaria* (*vulgaris*) *Linaria*, *Lycium vulgare*, *Lycopus sinuatus*, *Lycopus Virginicus*, *Lysimachia Nummularia*, *Lysimachia quadrifolia*, *Lysimachia* (*stricta*) *terrestris*, *Mentha piperita*, *Mentha* (*viridis*) *spicata*, *Onoclea sensibilis*, *Onoclea Struthiopteris*, *Poa* *pratensis*, *Populus alba*, *Reseda lutea*, *Robinia hispida*, *Robinia Pseudacacia*, *Robinia viscosa*, *Sagittaria latifolia*, *Stachys palustris*, *Teucrium Canadense*, *Thermopsis Caroliniana*, *Tussilago Farfara*, *Tussilago Petasites*.

In our botanic garden, to keep some of these plants within reasonable bounds, they were placed each within a piece of old smoke-stack a foot and a half in diameter and about two feet deep. Some of the plants do very well this way, but several of them leave the center vacant and run around the edge of the enclosure, reminding one of uneasy animals in a cage, while the Canada thistle thrives, putting its roots down deep into the soil. The first you know, these roots of the thistle run under the iron hoop and new plants pop up serenely from two to five feet distant. Plants that run around the margin are Stachys, Teucrium, *Aristolochia Clematitis*, while feeble plants of *Linaria Linaria*, though in rich earth, failed utterly last season. We had to change the soil and put in new plants to keep the stock good. They are impatient of restraint and want to ramble about at will, as plants almost seem to have a will.

The following twelve perennials among others in the garden have failed more or less or died, especially in the middle of the patch:

Boltonia asteroides, *Coreopsis lanceolata*, *Gecoma hederacea*, *Helianthus giganteus*, *Helianthus grosse-serratus*, *Marubium vulgare*, *Rudbeckia speciosa*, *Scrophularia Marylandica*, *Spathyema fœtida*, *Uvularia perfoliata*, *Viola lanceolata*, *Vleckia* (*Lophanthus*) *nepetoides*.

(TO BE CONCLUDED.)

Toward the latter part of July last, in company with several botanical friends, I took a short field excursion to a neighboring marsh always reported to be superb collecting ground, and such indeed we found it. Among other finds I secured plenty of Sundew (*Drosera rotundifolia*), which on returning home I placed in one of my artificial bogs. It soon blossomed and matured fruit, which was followed by a period of rest. The leaves had disappeared—nothing of the plant in sight but the ripened seed stalks, and I supposed the plants were all dead. A few days ago I noticed numerous little colonies of sundews appearing all over the bog. At first I supposed them to be seedlings, but on a closer inspection I found most of them proceeded from old leaves, generally from the upper surface. In a few instances they appeared from the under surface and edge of the leaf, like the *Bryophyllum*. This behavior was a surprise to me, as I have neither read nor heard of an instance before where the *Drosera* develops new plants from buds formed on the old leaves. But I have the clear evidence before me that they do.—*Jas. A. Graves*, *Susquehanna*, *Pa.*

THE PLANT WORLD,

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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THE word amateur is often applied as a mark of reproach to those who are unskilled or mere dabblers in an art or science. More correctly it should be applied to one who pursues a subject from taste or attachment, without a view to gain; in other words from the mere love of it. The botanist who is called an amateur in this latter signification need have no hesitation in accepting the term, for he will find himself in good company and with every incentive to do good work. As a matter of fact some of our most distinguished botanists have been only amateurs in this sense. The late Dr. George Engelmann, a skilled botanist and an authority on many difficult groups of plants, was all his life a practicing physician. His botanical work was accomplished in the midst of active professional life by snatching a few minutes here and there while visiting, or waiting for the calls of his patients. His notes and drawings were made on the backs of prescription blanks, and as a mark of his indomitable energy it may be added, they number more than 20,000, and fill sixty quarto volumes. Our most distinguished authority on the difficult group of willows, Mr. M. S. Bebb of Illinois, was a farmer. Other well known students and authorities have been jurists, bank presidents, druggists, teachers, railroad magnates, and in fact from almost all the walks of professional and business life. They have studied botany as a recreation.

This all teaches that there is abundant room, and that the amateur is welcome in botany. Let no one hesitate to take up the study of plants as a pastime for the fear that he may not find a place for his activity. He may perhaps not be able to discover as many species new to science as when the country was newer, but the finding of new species is not the sum total of botany, and even in this line much is being done every year, as the long list of new species appearing in the technical journals attests. There are problems in germination, in physiology, in histology, in plant distribution, and a host of other lines, that are awaiting elucidation on every hand. The life-history of very few plants is so well known that nothing remains to be found out. But above and beyond this is the pleasure of knowing something of the life and activity going on around us. No matter how far he may wander, the botanist is ever at home, for the plants are there also.

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Persons desiring specimens of the Sword Moss described in the last number may obtain them by sending a request accompanied by a two-cent stamp to Mrs. Elizabeth G. Britton, New Dorp, Staten Island, N. Y.

.... NOTES AND NEWS.....

The genus Astragalus (Milk-Vetch) is probably the largest genus of flowering plants in the world, over 1,300 species having been described. About 250 species are natives of North America.

The origin of the name flower-de-luce or fluer-de-lis, the common name of the iris, is of much interest, and has given rise to no little controversy. By some it is derived from *fleur-de-Louis*, from its having been assumed as his device by Louis VII. of France. From this it is supposed to have undergone various changes, having been in all probability contracted into fleur-de-luce, and finally into fleur-de-lys or fleur-de-lis. By others the name fleur-de-lys has been derived from *Löys*, in which manner the twelve first Louis signed their names, and which was easily contracted into Lys. Still others consider it means the flower that grows on the banks of the river *Lis*, which separates France and Artois from Flanders.

Dr. J. N. Rose, of the U. S. National Museum, has just returned from a five months' collecting expedition to Mexico. His first stop was made at Guaymas on the West Coast, where he remained for several days. Thence he went to La Paz in Lower California, and from there to Mazatlan and Acaponeta, where he joined Mr. E. W. Nelson of the U. S. Biological Survey, and together they crossed the two ranges of the Sierra Madre. These mountains rise in some places to 9,000 feet above the sea. Most of the collecting was done in the States of Durango, Zacatecas and Jalisco, in a region never before visited by a botanist, and Dr. Rose brings back a magnificent collection of 2,000 numbers and over 1,500 species. The party came out on the eastern side near Guadalajara and Dr. Rose also visited the City of Mexico on his return.

The sad death, in Jamaica, of Dr. J. E. Humphrey, creates a vacancy in the lectureship in botany at Johns Hopkins University. Dr. Humphrey was very popular with his students, and his loss will be much felt.

Among some violets recently collected in New Jersey were two plants in which the scapes instead of bearing the usual solitary flower and fruit, branched and bore three well-developed capsules, each on slender pedicels. This is a most unusual occurrence, if, indeed, it has ever been reported. The specimens have been placed in the National Herbarium; they are typical plants of the species now distinguished as *V. emarginata* (Nutt.) LeConte.—*Charles Louis Pollard, U. S. National Museum.*

I have for several years been the happy possessor of a bog garden. It is a small affair, no larger than what is contained within the boundary of a good-sized dinner plate, yet this diminutive thing has been the means, from time to time, of affording me a vast amount of pleasant watching, as well as affording the means for much instructive study. My little bog is easily prepared. The excavations and cement linings attended with annoying cracking and leakage are all dispensed with. Nothing is required but a good-sized earthen plate, enough suitable moss from the swamp to fill it and to hold the occupants in place and retain sufficient moisture to keep them in a healthy growing condition, adding more water occasionally to make up for the loss through evaporation and absorption. If the plants are crowded for room, another plate is added, prepared in the same manner. My bog garden affords perpetual enjoyment, for it is alike indifferent to "summer's heat and winter's cold." In the former it finds a place in the shade of a neighboring tree, and in the latter in a convenient window by the kitchen stove. From ten to twenty-five families, according to the size of their individual members, find ample room to develop in it, and did it not take more space than is now occupied by the plants, I would give their names. Many of them are "voluntaries," which are even more interesting than many of those transplanted. It is often the case, when only green sphagnum, fresh from the swamp, is used and provided with plenty of heat, light and moisture, that young plants will soon appear that often prove quite a surprise. Similar results may be obtained by securing before winter sets in, a large pan full of rich earth mold from some neighboring woods. Cover it and let it stand in a warm place for a few days, as the seed will germinate quicker. I was never more interested than in studying the behavior of a wood nettle (*Laportea Canadensis*) growing in such a pan of earth during the winter, nor more surprised than to behold a seedling of the poke-weed (*Phytolacca decandra*) pushing itself through the soil, when none had been seen for years within ten miles.—*Jas. A. Graves, Susquehanna, Pa.*

Several quite rare plants of the Southern Alleghanies were collected in Cocke county, Tenn., during the last week in August of this year. One was *Silene ovata* Pursh, a tall catchfly with white, fringed petals, related to the Starry Campion (*Silene stellata*). It was abundant at one point near Lemon's Gap, at an altitude of 3,500 feet or thereabouts, growing in fertile, open woods. With it grew *Thalictrum macrostylum*, a very distinct species of Meadow-Rue, published a few years ago by Dr. Small and Mr. Heller. The beautiful purple-flowered Turtle-Head (*Chelone Lyoni*) was abundant near the head of Wolf Creek, growing with the curious Umbrella-Leaf (*Diphylleria cymosa*), whose cymes of blue berries were quite conspicuous. On the Bluff Mountain, at about 4,500 feet altitude, that prettiest of dodders, *Cuscuta rostrata*, with bright golden stems and delicate white flowers grew in profusion, often upon a showy golden-rod, *Solidago Curtisii.* On dry cliffs along the French Broad *Pentstemon Smallii* made its home beside the Hairy Mock-Orange (*Philadelphus hirsutus*), both in mature fruit. In a dense tangle of blackberry-briars and musdine vines, on the river bank, excellent fruiting specimens of a rare loose-strife (*Lysimachia Fraseri*) were found. Some of the plants were four feet high. On a dry bank near the river quite a little thicket of the Small Rhododendron (*R. punctatum*) was discovered. Several new stations were found along the French Broad for that rare and beautiful shrub, *Buckleya distichophylla.* The pistillate plants bore an abundance of nearly ripe fruit. One of the most delicate of climbing plants, *Adlumia fungosa*, the Climbing Fumitory, hung in great masses of blossom from the branches of shrubs on a bluff near Point Rock. The Yellow-Wood (*Cladrastis tinctoria*), a singularly handsome tree, is quite abundant on the river bank about midway between Point Rock and Wolf Creek. Four years ago I found it in full blossom in May. This time a long search failed to reveal any fruit. It would be interesting to know whether the Yellow-Wood often sets fruit. Fourteen species of orchids were found about Wolf Creek, the rarest and most interesting being the odd, leafless *Hexalectris aphyllus*, with striped brown sepals and petals, and white and crimson lip. The blossoms exhale a faint odor of mignonette. A single ablino Cardinal-flower was discovered growing among the usual brilliant red forms. Its corollas were white, dashed with light pink.—*Thos. H. Kearney, Jr., U. S. Department Agriculture.*

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THE PINE-BARREN FLORA IN THE EAST TENNESSEE MOUNTAINS.

By Thomas H. Kearney, Jr.

FOLLOWING the coast of the Atlantic and Gulf States, from Cape Cod around to the mouth of the Trinity, in Texas, is a belt of low, flat, sandy country, generally known as the coastal plain. Popularly it is spoken of as the "pine-barrens," because of the two or three species of pine that are the most characteristic feature of its vegetation.

On the southern New England coast and on Long Island and Staten Island, the coastal plain is represented by small patches here and there, fragments of a wider region that has yielded gradually to the encroachments of the Atlantic. But, as we journey southward, this strip becomes ever wider, until in the far southern states it expands into a vast forest tract, often extending eighty miles or more back from the coast. Northward the Pitch Pine (*Pinus rigida*) is the prevailing tree, while in the South Atlantic and Gulf States thousands and thousands of acres are covered with a forest of the Long-Leaf Pine (*P. palustris*), unbroken, save where man has laid his destroying hand, or where the wide sluggish current of one of the great rivers interposes.

This pine-barren country has a very characteristic flora, a flora very largely American in its origin. Many plants of peculiar interest belong to it. Nearly all the Side-Saddle Flowers (species of *Sarracenia*) inhabit this region. Most of our species of Deer Grass (*Rhexia*), of Button-Snake-Root (*Lacinaria*), and of American Centaury (*Sabbatia*) are indigenous to the coastal plain Many showy plants of the Pea family (*Leguminosæ*), and of the Sun-flower family (*Compositæ*), brighten the floor of these otherwise rather sombre forests, while orchids and sedges flourish about the numerous pools and bogs.

One would hardly expect to find a large proportion of this flat country flora hidden among the high ridges of the Alleghanies; yet this is unmistakably the case. Especially along the picturesque French Broad river, in East Tennessee and Western North Carolina, there is a notable incursion of plants usually considered typical of the coastal plain.

In Cocke county, Tennessee, the French Broad flows through a narrow, canyon-like valley, where the margining hills often come down to the very river's brink But here and there the bluffs recede and leave the river elbow-room. In such places flat sandy tracts, covered with a growth of Pitch and Scrub Pine, often occur; not uncommonly these miniature pine-barrens push their way up on the lower, near-by ridges, crowding among the oaks and chestnuts that are the rightful tenants.

Not a few of the characteristic pine-barren plants inhabit these small patches. A tall Rosin-weed (*Silphium compositum*) is sure to attract attention in late summer. With it often grows a peculiar and handsome Sun-flower (*Helianthus atrorubens*). A beautiful variety of the common Indian-grass, with drooping satiny panicles of a chestnut-brown (*Andropogon nutans Linnæanus*) grows in the flat land near the river, along with the silvery Beard-grass (*Andropogon argyræus*), and the rough Drop-seed (*Sporobolus asper*). Often the pinkish, silky heads of a tall Plume-grass (*Erianthus alopecuroides*) stand stiffly up among the surrounding undergrowth.

A Golden Aster (*Chrysopsis graminifolia*) is abundant. A rather weed-like Croton (*C. glandulosus*) and a prostrate purple or white-flowered Cracca (*C. spicata*) are likewise common. The prickly-stemmed Sensitive Briar (*Morongia angustata*) grows luxuriantly among the grasses and the Chrysopsis. Beside it that odd grass, *Gymnopogon ambiguus*, spreads its slender panicles, to break off, as they ripen, and blow away like Old Witch Grass.

Back from the river, on the lower hills where oaks and chestnuts struggle with the invading pines for mastery, the occurrence of such plants as the Slender Lady's Tresses (*Gyrostachys simplex*), Blue-Hearts (*Buchnera Americana*), the Carolina Lily (*Lilium Carolinianum*),and the White Boneset (*Eupatorium album*), shows that the marauders have made their mark upon the country.

Half a mile back from the French Broad, opposite Wolf Creek station, is a remarkable tract of small sphagnum swamps separated by low ridges, called the "White Oak Flats," because of a fine growth of White Oak that divides sway with the pines. Here some of the characteristic vegetation of the pine-barren swamps was discovered. St. Peter's Wort (*Ascyrum stans*), the Two-flowered Rush (*Juncus* *acuminatus aristulatus*), the Colic-Root (*Aletris farinosa*), and two handsome orchids, the Yellow-fringed Orchis(*Habenaria ciliaris*) and the Meedow Pink (*Limodorum pulchellum*) grow among the sphagnum.

In other parts of the East Tennessee mountains may be found traces of the pine-barren flora. On the Cade's Cove mountains, in Blount county, *Pagonia divaricata*, an orchid generally supposed to be peculiar to the coastal plain, flourishes among small bushes of the Hairy Huckleberry (*Vaccinium hirsutum*). Two or three asters and golden-rods, and several species of boneset, all distinctive of the pine-forest belt, occur now and then as stragglers along the rivers and on the dry, pine-clad ridges of the Southern Alleghanies.

In the valley of the Hiwassee, in Polk county, *Decumaria barbara*, a beautiful climber of the Saxifrage family, is frequent on the river banks, ascending tall trees. This is a characteristic plant of the river-swamps along the southern coasts. *Itea Virginica*, a shrub belonging to the same family, and likewise an inhabitant of the pine-barren swamps, is met with in some of the mountain valleys of East Tennessee.

Another curious fact is that several small genera of trees and shrubs are represented bp two species in Eastern North America, one in the low pine-barren region, another in the mountains. This is true of the Sweet Shrubs (*Butneria*), the beautiful *Stuartias*, the White Alders (*Clethra*), *Fothergilla*, a relative of the Witch-hazel, and the Silver-Bell Trees (*Mohrodendron*). In the last case there are two low-country species

What are we to infer from the presence of these austro-riparian plants among the flora of northern origin that chiefly covers these mountains? Possibly they are the advance-guard of an invading army. Much more probably, however, they are the lingering survivals of a more southern flora, once widely distributed over the southern Appalachian region.

HOUSES BUILT OF FOSSIL TREES.

By Walter Hough.

IN THE celebrated Petrified Forest, which is some eighteen miles from Holbrook, Arizona, on the picturesque Santa Fé Railroad, there are ruins of several ancient Indian villages. These villages are small, in some cases having merely a few houses, but what gives them a peculiar interest is that they were built of logs of beautiful fossil wood. The trees of which they are made are known as Araucarioxylon, and have no living representatives nearer than Chili and the Pacific Islands.

During the process of fossilization the trunks of these ancient conifers which had fallen and sunk down in the soft mud of the Jura-Trias lake shores became divided into cylinders, from two to rarely more than ten feet in length, so that they can scarcely be called logs. The prehistoric dwellers of the land selected cylinders of uniform size, which were seemingly determined by the carrying strength of a man. It is probable that prehistoric builders never chose more beautiful stones for the construction of their habitations than the trunks of the trees which flourished ages before man appeared on the earth.

This wood agate also furnished material for stone hammers, arrow heads and knives, which are often found in ruins hundreds of miles from the forest, the vivid colors, no doubt, being very attractive to the ancient people, who made long journeys for the stone.

The visit to the Petrified Forest was one of the most pleasant experiences which has fallen to the lot of the writer during his ethnological explorations in Arizona. In the valleys gnawed from the edge of the "bad lands," surrounded by fantastic pinnacles and mesas, lie in chaotic confusion, sections of the fossil trees, too hard for the tooth of time, which has formed the landscape around them. The ground is covered with gaudy fragments, which tempt the traveler to load himself down with specimens, and every step makes one feel that he is in an enchanted land.

Dr. W. J. Beal calls attention to the fact that the achenes of the arrow-head, bur-reed and water-plantain have corky margins which serve to float them on water. If this is cut off, the achenes sink at once. The achenes of *Carex Asa-Grayi* and many others found on low lands are surrounded by an inflated sack with which they float and without which they sink, while the upland Sedge, *Carex communis*, and some others have the sack (perigynium) fitting tightly, and hence they readily sink in fresh water.

Prof. L. H. Pammel has just published a valuable contribution [Bull. No. 9, Division of Agrostology, U. S. Dept. Agric.] on the "Grasses and Forage Plants of Iowa, Nebraska and Colorado." It is divided into three parts, the first including observations on the physical features of the States named; the second an enumeration of the more important grasses and forage plants arranged alphabetically, with economic notes; and the third is a classified list of the grasses of these States collected by the author during 1895 and 1896. The report is enriched by numerous illustrations.

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

III. THE GRASSES, SEDGES AND RUSHES.

FROM sad experience I am able to assert as a fact that there are no plant families so difficult for the beginner to distinguish as those which the farmer would designate by the comprehensive term "hay." The plants agree in having small, inconspicuous flowers, and the absence of anything flower-like in their appearance is so marked that I have been assured many times by rural friends that "grasses just grow seeds without any blossoms." Nor can we rely on habitat to separate these groups, for the hay cut from the salt marsh as well as that from the upland meadows will probable contain an intermixture of all three.

There are, however, important differences, and since for forage purposes the grasses are far more important than either sedges or rushes, it is well for even the amateur to be able to understand them thoroughly.

The *Gramineæ* (sometimes called *Poaceæ*), or genuine grasses, form one of the largest families of flowering plants, over 300 genera and 3,500 species being recognized. The inflorescence consists of what are technically called "spikelets," each of which is made up of small, imbricated, chaffy scales. Some of these scales are empty; others enclose the stamens, usually three, and the pistil; and each of these flower-bearing scales usually encloses an additional, very slender scale known as the "palet." Every individual floret thus consists of the essential organs, stamens and pistils, surrounded by two protecting scales, a number of which are borne together on a slender axis, forming a spikelet; while the innumerable spikelets may be clustered in a spike, as in timothy, or borne in an open, branching panicle, as in red-top and many other grasses.

The leaves of these plants are so well known that the term grass-like is common as a standard of comparison. At the junction of leaf and stem, where the base of the leaf usually forms a complete enwrapping sheath, will be noticed in most cases a peculiar membranous ring or protuberance; this is called the ligule, a name derived from its suggestion of a little thong or strap, and it is an indisputable proof, if present, that we have a grass and not a sedge or rush before us. The stems are usually hollow, except at the joints.

All of our cereals, as wheat, rye, oats, etc., are derived from various grasses, many of which have their wild relatives growing abundantly in our fields. Thus the sorghum of commerce belongs to the same genus as the dreaded "Johnson-grass" of the South (*Sorghum halepense*), one of the worst usurpers of cultivated lands.

The Sedges (*Cyperaceæ*) also form a large family, with 65 genera and 3,000 species; more than a third of the species, however, are comprised in the single genus Carex. Like the grasses, the inflorescence is in spikes or panicles, made up of small spikelets; but when we come to examine the scales we shall find that there is no palet, *i. e*, the flower-bearing scale is single instead of double. Moreover, there is nearly always to be found some trace of a floral envelope, in the shape of small bristles. The leaves are sometimes grass-like, sometimes slender and wiry, but never exhibit ligules at their bases. The stem is almost invariably solid.

These plants, as has been intimated, grow intermixed with grass in various situations, the majority of the species, however, where the soil is somewhat moist. In certain sections of the country where the native grasses are few and scanty, various sedges are of value for forage purposes, but the seeds, not being rich in starch, are not used for food.

The Rushes or Bulrushes (*Juncaceæ*) take us several steps higher in the ascending scale of plant development. These plants have a distinct floral envelope or perianth, of six parts, but the texture is dry and chaffy, like the scales of the last two families. The ovary differs from that of the grasses and sedges in being three-celled instead of one-celled, so that the seeds are several instead of one in each seed-pod. The family contains only seven genera with about 200 species; the typical genus, Juncus, embraces three-fourths of these. The plants have little economic value; in Holland they are used as winter coverings for the newly planted bed of hyacinths and tulips; in this we have a peculiar coincidence, for the Juncaceæ are generally believed to be reduced members of the original great Lily family, of which the hyacinth and tulip are conspicuous examples. This group, with its allies, will form the subject of next month's paper.

Dr. Charles Mohr of Mobile, Alabama, is now at the National Herbarium in Washington, finishing the manuscript for his Catalogue of Alabama Plants. It is to be published as a contribution from the National Herbarium, and will contain descriptions of the new, rare or otherwise interesting species found in the State.

Prof. O. F. Cook has returned from his expedition of last winter to Liberia, bringing with him to the U. S. National Museum a valuable collection of plants. He has consented to contribute to an early issue of THE PLANT WORLD an article on African botanizing.

FERTILIZATION OF THE CRIMSON THREAD-FLOWER
(Poinciana Gillesii).

By Bessie L. Putnam.

I HAVE been much interested in the fertilization of *Poinciana Gillesii*, and thus far have not satisfied myself as to the manner in which it is accomplished.

In the large flower clusters there are seldom more than four or five blossoms open at once, these opening successively from below and the flowering stem lengthening as they expand. So far as I have observed, the greater part of the flowers open between mid-day and sunset, though some appear earlier in the day. The slender and beautifully colored stamens, fully thrice the length of the corolla, are coiled and packed into the bud with exquisite daintiness (Fig. 1).

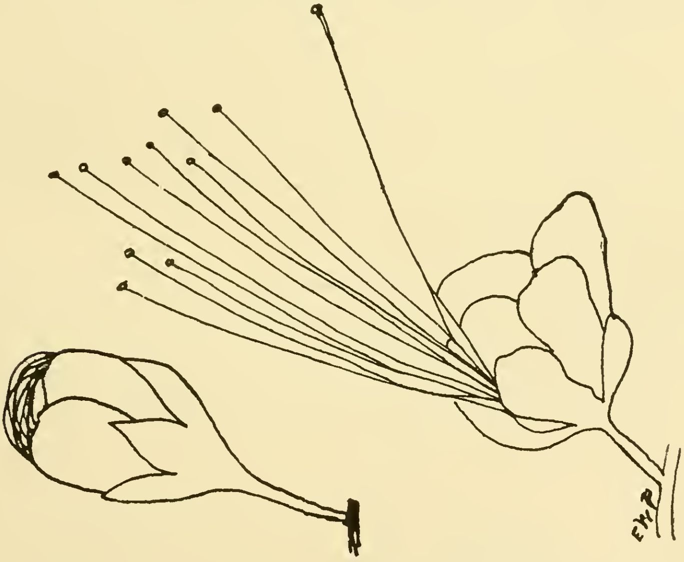

FIG. 1. FIG. 2.

When the flower opens the stamens and pistils assume the position shown in Fig. 2, the stigma apparently studiously avoiding any possible contact with the anthers. Later, probably the following day, the essential organs assume the relative positions shown in Fig. 3 *b*, the stigma no longer receptive, and most of the pollen scattered. Twenty-four hours later most of the stamens have fallen (Fig. 3 *c*).

Evidently fertilization is but imperfectly performed in this northern clime, for in no instance did more than three or four of the large number of flowers in each cluster mature fruit—and this not sufficiently developed to germinate. The conspicuous form and color of the blossoms indicate that it is especially adapted to insect fertilization; yet in repeated observations I have never seen it visited by them, nor can I see that the long stamens and pistil of either the same or contiguous flowers ever come in contact. Humming-birds visit it freely, but always approach from *below*, never, so far as I can detect, touching either stamens or pistil. The fact that the anthers do not open as soon as the corolla, precludes the possibility of fertilization in bud. I found the pistil short in one or two flowers that opened in the house in mid-winter; but the dwarfed appearance of the blossoms leads me to think this merely a deficiency and not an illustration of dimorphism.

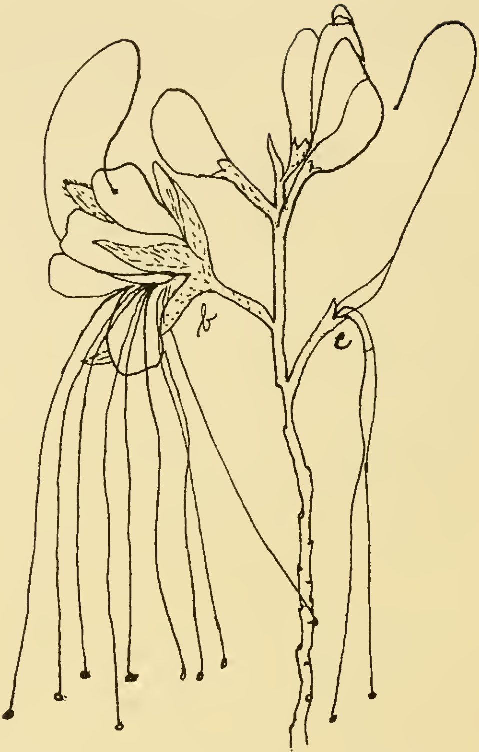

FIG. 3.

The most probable supposition is that some nocturnal visitor is the agent; yet the peculiar form of the flower suggests special adaptations. Will not some one familiar with its growth in southern climes and under the most favorable circumstances elucidate the matter.

NATIONAL FORESTS AND THEIR PRESERVATION.

IN February, 1896, the Hon. Hoke Smith, then Secretary of the Interior, called upon the president of the National Academy of Sciences for an expression of opinion from that body regarding the inauguration of a forestry policy for the forested lands of the United States. A committee was immediately appointed, consisting of seven members, who spent many months in investigating the questions in the field, and their report has just been published by the Government Printing Office.

The report first reviews the forestry policy that has already been adopted by various foreign governments, and shows the value that has come from intelligent control. Thus the annual revenue from the government forests of France and Algiers exceeds $6,000,000, and the expenses for 1896 were estimated at $3,300,000. The forest administration of Prussia contributes a large sum to the revenue, the annual receipts being about $14,000,000 and the expenditures about $8,000,000. In British India the surplus has grown from less than 2,000,000 rupees in 1870–71 to almost 7,500,000 rupees in 1894–95. It is clear, therefore, that when viewed solely from the point of dollars and cents, the ends attained amply justify the means.

The report then takes up the reserved forest lands of our public domain and shows how the timber is being wasted and destroyed. Forest fires cause the annual destruction of thousands of acres of valuable standing timber, and the nomadic sheep husbandry, by grazing off the seedling trees, prevents re-foresting. Unfortunately not the least source of loss is from timber taken from the public domain without the knowledge and consent of the government and without even a pretense of payment.

The committee then formulate a careful system of forest administration, which shall include a competent force of employes and will not cost to exceed $250,000 annually for the first five years. This seems a very small sum when compared with the value of the property involved, and of the devastation which must come without it.

In the last number of this journal Mr. Jas. A. Graves described the growth of new plants of the Sundew (*Drosera rotundifolia*) from the surface or edges of old leaves. The following sketches, which unfortunately came too late to accompany his note, show very clearly the phenomenon which he described.—[Editor.]

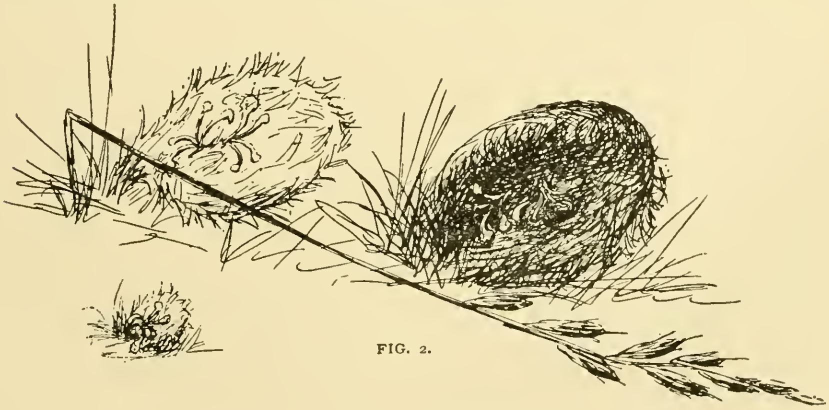

FIG. 2.

FIG. 1.

Fig. 1—Leaf natural size. Fig. 2.—Old leaves, with new plants; much enlarged.

HOW PLANTS FLEE FROM THEIR ENEMIES.

SOME REASONS FOR PLANT MIGRATIONS.

By W. J. Beal.

(CONCLUDED.)

HERE permit me to quote a little from a paper presented at the recent meeting of the Society for the promotion of Agricultural Science:

> "It is very instructive to note how much better many of the weeds thrive when they get away from the spots where they have been confined for two to six years. Seedlings of *Datura Tatula* are larger in the bed of *Plantago major* than they are in their own bed where their parents grew. After three years the plantain mentioned has nearly run out, and *Amaranthus albus* has entirely disappeared. *Chenopodium album* grew finely for a couple of years, but of late has made a small display, and has suffered from the attacks of insects and probably from other causes.
>
> *Panicum Crus-galli* behaved like *Chenopodium*, and has had a hard time of it, needing considerable attention. Barnyard grass likes the best that can be got, and if it can't get that, will go into a rapid decline.
>
> The seedlings of *Polygonum Persicaria* are feeble this year and are overtopped by intruders from adjoining plots, such as ragweed and prickly lettuce.
>
> *Chenopodium glaucum* doesn't seem very persistent for a plant that ranks among the weeds, but it shies off from its home ground as though searching for fresh fields. *Thlaspi arvense* is very feeble, and like the last, seems to be hunting for a soft place that just suits it. *Polygonum aviculare* grows near the foot-path about the doors of dwellings, and thrives with abuse, seeming to enjoy tramping upon by feet, but in my plots, I have difficulty in growing it. Insects prey upon it; rust causes it to dwindle and disappear. Motherwort grows rank, four feet high near the barnyard fence and the flowers are covered with bees, but when kept several years in the same bed it goes off into the sulks as though neglected. In moist, rich and mellow siol *Cyperus esculentus* grows luxuriantly for a couple of years, and after that makes little display, as though tired out and pining for something new."

Almost every one has seen or heard about fairy rings often seen in lawns or old pastures. Here some species of fungi, such as *Marasmius oreoides* and others spread out a foot or so each year, more or less, in the form of a circle, killing or weakening the grass where it grows. These plants seem to require a fresh place for growth each year.

Marsilia quadrifolia and the wild rice (*Zizania aquatica*) have often been driven from the pond to the extreme margin and sometimes above the edge of the water by some insect, crustacean or snail. Beyond the reach of these enemies they thrive well from year to year. During the winter of 1894–95 the ice on the pond was solid and of unusual thickness for many weeks. The loss of air, with the cold or something else caused the death of all the fish and most likely many of the other small animals. The following summer Marsilia and wild rice spread out and grew in the water as never before nor since, for their enemies had been killed. Pringle, in notes on Mexico, speaks of collecting grasses beneath the thorn bushes, where they had not been reached by cattle.

Wallace, in his work on Darwinism, says:

> "People do not see the constant and daily search after food, the failure to obtain which means weakness or death; the constant effort to escape enemies; the ever-recurring struggle against the forces of nature."

This statement made with reference to animals, seems to apply equally well to plants. Again I quote from Wallace:

> "It is not so commonly known that if a garden is left to become altogether wild, the weeds that first take possession of it, often covering the whole surface of the ground with two or three different kinds, will themselves be supplanted by others, so that in a few years many of the original flowers and of the earliest weeds may alike have disappeared. This is one of the very simplest cases of the struggle for existence, resulting in the successive displacement of one set of species by another; but the exact causes of this displacement are by no means of such a simple nature. All the plants concerned may be perfectly hardy, all may grow freely from seed, yet when left alone for a number of years, each set is in turn driven out by a succeeding set."

DeCandalle says:

> "All the plants of a country are at war with each other, each one struggling to occupy ground at the expense of its neighbor."

Again from Wallace:

> "Besides this direct competition, there is one not less powerful arising from the exposure of almost all plants to destruction by animals. The buds are destroyed by birds, the leaves by caterpillars, the seeds by weevils; some insects bore into the trunk, others burrow in the twigs and leaves; slugs devour the young seedlings and the tender shoots, wireworms gnaw the roots. Herbivorous mammals devour many species bodily, while some uproot and devour the buried tubers.
>
> "Besides having to protect themselves against competing plants and against destructive animals, each species can sustain a certain amount of heat and cold, each requires a certain amount of moisture at the right season, each wants a proper amount of light or of direct sunshine, each needs certain elements in the soil. The struggle for existence in plants is threefold in character and infinite in complexity.
>
> "We must not overlook the fact so well established that one of the greatest points to be gained by migration, is to enable the flowers of different stocks of a species to be cross-fertilized and thereby improved in vigor and productiveness.
>
> "No doubt many of these facts are familiar to you, if so, all the better, for we can then discuss their meaning to greater advantage. They teach emphatically some of the good reasons for a rotation of crops, which means new fields for old or for new plants. As Lubbock says in his " Flowers, Fruits and Leaves": 'Farmers have found by experience that it is not desirable to grow the same crops in the same field year after year, because the soil becomes more or less exhausted. The powers of dispersion possessed by many seeds are a great advantage to the species. Moreover they are also advantageous in giving the seed a chance of germinating in new localities suitable to the requirements of the species.'"

People often think of animals as traveling from place to place, but forget that plants can travel as well. By an almost infinite number of devices seeds and fruits of plants flee from the parental spot on the wings of the wind, float on currents of ocean, lake and river. They are shot by bursting pods and capsules in every direction. With hooks and glands they cling to the coverings of animals. Allured by brilliant colors birds and many other animals seek and devour the fruits of many plants, the seeds of which are preserved from harm by a solid armor and are soon sown broadcast over the land ready to start new colonies. Nuts are often carried by squirrels, a few in a place for many rods and there securely buried. By a slow process which amounts to considerable in a few years, many plants send forth roots, rootstocks, stolons and runners and thus increase their possessions or find new homes.

The various devices by which plants are shifted from place to place is not merely to extend and multiply the species and reach a fertile soil, but to enable them to flee from the great number of their own kind, and their enemies among plants and parasitic plants. The adventurers among plants often meet with the best success, not because the seeds are larger or stronger or better, but because they find for a time more congenial surroundings. Our weeds are good illustrations of this point. They are carried for long distances by man and by him are planted in new ground that has been well prepared. Every horticulturalist knows that apples grown in a new country, if suitable for apples, are fair and healthy, but the scab and codling moth and bitter rot and bark louse sooner or later arrive, each to begin its peculiar mode of warfare. Peach trees in new places remote from others are often easily grown and free from dangers, but soon will arrive the yellows, borers, leaf curl, rot, and a number of other enemies to combat. For a few years plums are grown without danger from curculio or rot or shothole fungus. It has long been known that the surest way to grow a few cabbages, radishes, squashes, cucumbers or potatoes is to plant them here and there in good soil at considerable distances from where any have heretofore been grown. For a time enemies do not find them. I have often noticed that while pear blight decimated or swept off large portions of a pear orchard, a few isolated trees scattered about the neighborhood—many neighborhoods—usually remain healthy. The virgin soil of the Dakotas produced at a trifling expense healthy, clean wheat, but it was not long before the Russian thistle, false flax and other pests followed to contest their rights to the soil. If, as in endemic species, they seem for some reason to be much restricted, they are very likely to become extinct and give way to those not so restricted. Perhaps one reason why some plants have become extinct or nearly so is their lack of means of migration. As animals starve out in certain seasons when food is scarce, or, more likely, migrate to regions which can afford food, so plants desert worn-out land and seek fresh fields. As animals retreat to secluded and isolated spots to escape their enemies, so many plants accomplish the same thing by finding the best places with some of their seeds sown in many regions. Frequent rotations seem to be the rule for many plants when left to themselves in a state of nature. Confining to a permanent spot invites parasites and other enemies and a depleted soil, while health and vigor are secured by frequent migrations.

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

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ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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The question is often asked as to why it should be necessary to give long, and seemingly unpronounceable and unmeaning Latin names to all plants and animals. To the trained naturalist this question is of course a very simple one, but to the beginner in science it is often formidable, not to say forbidding. Why, for example, should it be necessary to use Platanus occidentalis when we mean the common sycamore, or Amelanchier Canadensis when referring to the shad-bush? If English were a universal language, and the names sycamore and shad-bush were the only ones ever applied to these particular plants, it would be sufficient; but when it is remembered that English is only one of the great groups of languages, it is easy to see that the French, German or Russian student could just as logically demand that these plants be given and be known only by French, German or Russian names. The use of common names is further complicated by the fact that a plant is often known by different names in various parts of the world. Thus the name sycamore is applied in this country to at least four distinct species of Platanus, which, in addition, are known as button-woods, button-ball trees and water-beeches. The shad-bush is also called June-berry, service-tree, service-berry and May-cherry in various parts of the country.

On the other hand Latin is the universal language of science, and when Platanus occidentalis or Amelanchier Canadensis is employed, the botanist, whether he be English, French, German, Russian or other nationality, knows precisely what is meant. Any plant may have, indeed often does, if it has a wide distribution, almost as many common names as there are nationalities, but it has only one Latin name. It is, therefore, not only a matter of convenience, but a matter of necessity, to give Latin names to our plants and animals, and without it there would be only hopeless confusion.

Notwithstanding the popular prejudice against scientific names, a great many are in daily use without, perhaps, the users knowing that they are Latin. For example, such common names as Geranium, Pelargonium, Fuchsia, Rhododendron, Azailia, Chrysanthemum, Narcissus, Crocus, Iris, Hibiscus, Dahlia, Spiræa, Magnolia, Syringa, Aster, Catalpa, Clematis, Wistaria, Cosmos, Phlox, etc., are the Latin scientific names of these plants.

⁂

THE city of Brooklyn, N. Y., has had much trouble with its drinking water, complaint being made especially during the summer months, of its objectionable appearance, strong fishy or oily taste, and disagreeable odor. The causes of this condition have been investigated by Professor Leeds of the Stevens Institute of Technology, who finds that the whole trouble is due to the presence, in immense numbers, of a minute plant, a diatom, known as *Asterionella flavör*. In some samples of water as many as twenty million individuals to the gallon were found. This diatom is enclosed in the usual silicious skeleton and has the power of secreting a substance in the nature of an oil, which possesses the peculiar taste and odor above described. This oily taste-producing substance is volatile and cannot be gotten rid of by distillation. The water itself was found to be colorless, the apparent color being due to the suspended organisms. The problem of how to purify the water is naturally an important one. Filtration of the water was of no avail, and ærating it only tended to aggravate the trouble. The only remedy that has proved effectual so far is that of excluding the light, and converting the reservoirs into subterranean basins, as the Asterionella cannot live in darkness.

⁂

THE recent sad death of a well-known resident of Washington, caused by eating poisonous mushrooms, emphasizes the importance of becoming thoroughly familiar with the various edible species before we place trust in our powers of discrimination. Unless one has a fairly complete knowledge of the fleshy fungi it is better to gather nothing but the field mushroom (*Agaricus campestris*), which is nearly always unmistakable. The Department of Agriculture is shortly to issue a bulletin on this subject, with plates, giving careful descriptions of the edible species and such poisonous forms as are likely to be confused with them.

According to Prof. L. R. Jones of the Vermont Experiment Station, the Orange hawkweed (*Hieracium aurantiacum*) threatens to become one of the most troublesome weed pests of the State. His report [Bull. Vt. Ex. Sta. No. 56] furnishes an account of the relationship, origin and distribution of the weed, together with the damage it does and the means of its eradication.

. . . . NOTES AND NEWS. . . . .

Mr. John M. Holzinger has printed a list of mosses collected on Pike's Peak, Colorado, at an elevation of 12,000 to 14,000 feet, which includes nineteen species in twelve different genera. Several species of *Grimmia* and *Orthotrichum* have not yet been critically studied, and give promise of interesting results.

Dr. Joseph Crawford, a well-known Philadelphia botanist, is making an enterprising attempt to cultivate that shyest and smallest of our ferns *Schizæa pusilla.* He has succeeded in inducing several plants to survive the winter in a large, covered glass jar among moss and other ferns; they have, however, produced no fertile fronds during the summer.

A quantity of tubers of the potato, grown last year, have recently been taken from a rather dry cellar, where they had sprouted. Some of them had produced new tubers at the expense of the old. In some cases the new tubers were very close to the old ones, while in other cases they were carried out a foot or more on very slender stems.—*Dr. W. J. Beal, Michigan Agricultural College.*

At a recent meeting of the Botanical Club of the Michigan Agricultural College, Professor C. F. Wheeler exhibited a number of branches, large and small, of the common cottonwood and the large-toothed aspen. These branches, on slow-growing limbs, are much enlarged at the base, and at this spot are brittle and often separate from the tree. Under a cottonwood bushels of such limbs can now be picked up. These trees are common in low land, and like the snap-willow long ago described by Dr. Beal [*Bull. Torr. Bot. Club*, 1882, p. 89], this seems to be a device for multiplying and spreading the species.

During the last week of August this year, while collecting in Cocke county, East Tennessee, I noticed several plants in blossom whose proper flowering time is in early spring. A small bush of the service-berry (*Amelanchier Canadensis*) bore a single raceme of snowy blossoms that looked decidedly odd with their unusual accompaniment of fully developed foliage. The shrub grew on an exposed sandstone ledge above the French Broad river. Several specimens of Shrub Yellow-root (*Xanthorhiza apiifolia*) were found, bearing very young fruit, and must have been recently in flower. A few plants of the Violet Wood-Sorrel (*Oxalis violacea*), and of the Rue Anemone (*Syndesmon thalictroides*) were also found in blossom.—*Thos. H. Kearney, Jr., U. S. Department of Agriculture.*

Every one is familiar with the Cinnamon vine (*Dioscorea Batatas*), its clean, glossy foliage and rapid growth rendering it a universal favorite. The so-called Air Potato, however, a tropical species of the same genus, is apparently not well-known outside of Florida, where it is often grown for the sake of the large, edible tubers that form in the axils of the leaves. During the past summer this vine has covered a post in my garden with its luxuriant green foliage. The leaves are almost orbicular in outline, and fully three times as large as those of the cinnamon vine; and there are now several tubers hanging from the main stem.—*C. L. Pollard*

According to Professor Joseph LeConte of the University of California, a vigorous vegetation, as for example an average field-crop or a thick forest, makes about 2,000 pounds of dried organic matter per annum per acre, or 100 tons per century. But 100 tons of vegetable matter compressed to the specific gravity of coal and spread over an acre would make a layer less than two-thirds of an inch deep. Yet vegetable matter in changing to coal loses on an average four-fifths of its weight, and therefore vigorous vegetation at present could make only about one-eighth of an inch of coal per century. To make a layer one foot thick would require nearly ten thousand years, but the aggregate thickness in certain coal basins is 100 or even 150 feet, and this would require, the former nearly a million and the latter a million four hundred thousand years

In September last, while operating in southwestern Kansas, near Belvidere, Kiowa county, Mr. C. N. Gould of Southwest Kansas College, Winfield, Kansas, who was in my party, informed me that some nine miles southeast of Belvidere, on Elk Creek, near the northeast corner of Comanche county, he had seen a little thorny bush bearing bean-pods, that no one could name for him. I at once suspected it to be the mesquite, but had never heard of its growing north of Texas, the boundary line of which is some 300 miles south of that point. On the 15th we visited this place, and Mr. Gould pointed out the bush. It was only four feet high, and fruiting profusely. My suspicions were fully sustained, as it proved to be the *Prosopis juliflora*, at least that form of it in which the leaflets are set far apart, and which was called *P. glandulosa* by Torrey, who considered it distinct from the form in Arizona and westward. This is almost certainly the most northern point at which this genus has thus far been found, and it does not occur in any of the books that include only the State of Kansas in their southern range. Its low, stunted character further shows that this little straggler was out of its normal habitat and had reached its extreme northern limit. The spot is about twenty-five miles north of the Kansas–Oklahoma line.—*Lester F. Ward, U. S. National Museum.*

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THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

VOL. I. JANUARY, 1898. NO. 4.

STIPULES.

By A. A. Tyler.

EVERY lover of plants is familiar with those little appendages which form the wings at the base of the petiole of a rose-leaf, that in the buds of the tulip-tree in spring-time form such a dainty little case for the curiously folded infant leaf, or in the locust appear as spines warning off predacious animals and pricking the hands of one ambitious to carry home a bouquet of its fragrant white blossoms as do the prickles of the rose, more famed in poetical allusion. These appendages since the days of Linnæus, that great forebear of botanists, have borne the name of stipules and have often demanded the close attention of one who, book in hand, would decide whether he has found *Porteranthus trifoliata* or *stipulata*, or is lost among the mazes of the willow tribe.

Farther than this, perhaps few have gone or stopped to enquire what may be the purpose of these little appendages, why they came to be, and how it is that in some families of plants there are none at all, while in others there are few species, if any, without them. To the ever curious lover of nature the proposal of such questions as these at once arouses the innate desire to know, which leads on to the slow but sure unraveling of one after another of the secrets of the world about us.

What then, first, are the stipules for? Some will have noticed, when drawn by the warmth of spring-time days to seek again the woodland paths, the bursting buds of oaks and beeches, and how the young leaves are covered and intermingled with long, narrow, brown or reddish scales which fall away as fast as the loosening of the parts of the growing bud permits. These are the stipules which on examination will be found in pairs with each young leaf, and which during the winter months have protected the buds from cold and wet. If now we pass on to mid-summer and visit the vegetable garden where the pea-vines are climbing up their trellises of brush, we shall see stipules of quite another sort. Down at the base of the petiole, as before, they will be found, but broadly expanded, as large as the leaflets and like them green and succulent. These stipules do not fall away but form part of the laboratory of the plant where in the sunlight starch is constantly forming in the abundant chlorophyl grains for the use of the plant in building its tissues, forming its flowers and ripening its seed.

Another case of great interest in which the stipules serve the same purpose as the leaf-blade is found in the bedstraws and their relatives, which are described as having whorled leaves but are recognized in reality to have opposite leaves, the remaining parts of the whorl being stipules which have attained the same size and importance as the leaves themselves but never producing buds in their axils, the branches all springing from the axils of the opposite true leaves, as any one may observe. Nor is the vascular tissue supplied directly from the stem bundles as to the true leaves, but from a nodal girdle which originates in the bundles belonging to the leaves. We have already spoken of the protective function of the spiny stipules of the locust and how they ward off intruders. Similar spines in the Acacias, a genus of tropical leguminous plants, have in some species attained a very remarkable size, presenting the appearance of a pair of miniature ox-horns at the base of each leaf. These are hollow, and we are told by the naturalist, Belt, in his narrative of travels in Nicaragua that some kinds of ants often take possession and find in them safe and comfortable homes. These are the most important of the uses of stipules.

Next we are asked: Why did stipules come to be ? This is a more difficult question and requires us to go farther for an answer. We must examine the growth of buds and compare with one another the simple outer scales, the mature leaves in all their parts, and the gradually modified intermediate forms of the lower part of a young shoot. Still further we must go to the records of the dead past preserved in the rocks and compare the forms of fossil leaves with those of their most nearly related living representatives and examine the data obtained in the light of the established theories of creation by evolution, of the more or less complete summing up in the development of each organic individual of the historic steps in the evolution of its type, and the gradual disappearance of ancestral organs that have become useless. As we observe in order the leaves of the young stem of such plants as the false indigo or agrimony, whose subterranean buds develop in spring-time under very primitive conditions, we find a series of forms representing a summary of the historical development of the mature adult leaves. We cannot take for this purpose the plumule, the bud of the seed, for it is a very special kind of bud and it does not therefore show, in its development in the leaves of the seedling, an historical series such as is found in the ordinary bud, especially if it be a subterranean one.

The first leaves of a young shoot of false indigo as it springs from a strong subterranean bud are mere sheathing scales, representing the primitive leaf-forms of some very remote ancestor, then follow one or two which are three-toothed at the apex and another in which the central tooth has developed into a small blade. Next the blade shows the three leaflets typical of the adult leaf and the clefts separating the lateral teeth of the scale have deepened. These teeth are in fact the tips of adnate stipules. The farther up the stem we carry our observations the greater the degree of separation of the stipules and the greater the relative development of the lamina with its petiole which has appeared first at about the seventh leaf. As soon as the separation of the stipules is complete, at about the tenth leaf, degeneration begins, and only a few leaves higher up scarcely any trace of them can be found. The interpretation of these facts shows us that the leaves of the primitive ancestral flowering plants were mere protective scales, that in the course of evolution the need of greater assimilative capacity arose and as the leaf was best adapted for receiving this special function it was upon it that the office devolved. Then began that series of evolutionary changes which has formed out of the same primitive scale all the great variety of leaf-forms which today meet us on every hand and please our eyes, our tastes and fancies with never ceasing changes, just as the potter with one lump of clay may make a hundred different objects of usefulness and beauty. That this is the correct interpretation is more firmly established by the fact that the farther back we go in the records of the past and study the forms of fossil leaves, the more simple they become, and though they have not yet been traced back to the most primitive forms, since authentic remains of the primitive flowering plants have not yet been found, yet all the evidence we have from this source points in the direction of our conclusion.

We have seen that in the false indigo it was the tip of the scale which developed into the leaf-blade bearing the assimilative function and that the lateral parts became first adnate stipules, then free stipules and later disappeared by degeneration. But, is this always the case? It is not, and we are now brought to the third question: How is it that some families of plants have no stipules at all, except perhaps in a few species, and in others they are wanting in few species if any? The answer is that it is owing merely to the different ways in which the simple original leaf was modified in the varying courses of its evolution into modern forms. It may be observed that the veins of the lower bud scales of a plant are approximately parallel and we conclude that the earliest forms evolved from the primitive leaf included all its parts in the blade and were parallel-veined as we see them in the simply organized monocotyledonous plants of the present day. In some cases, however, the lateral stipular parts are distinguishable at their apices as in the formation of the ligule of grasses, the stipule of pond-weeds, which is a ligule rendered axillary by the degeneration of the petiole, and the lateral parts of sheathing petioles as in the calla and palm. Similar cases occur among the dicotyledonous plants in the ochrea of the knot-weeds and the sheathing petiole of many members of the crowfoot and parsley families.

In some of the lower families of dicotyledonous plants the whole of the primitive leaf has been transformed into the modern form. In Sassafras this transformation may be distinctly traced in a series of bud-scales and early leaves. In families with stipulate leaves, the modifications have been as we have seen them in false indigo, the evolutionary changes ceasing at various points giving origin to stipules with varying degrees of adnation or to those that are entirely free. As also it was observed that the stipules finally disappeared altogether, so some families with leaves once stipulate may have lost nearly all trace of them. Such is the honeysuckle family with leaves now usually exstipulate, but fugacious stipules are present in some species of Viburnum and elder, and one European species of elder has permanent stipules.

Stipules are then the representatives of the lateral portions of the primitive leaf when separated in a greater or less degree from the rest of the leaf, but the same primitive tissues form the ligule, ochrea and the margin of sheathing petioles and are often incorporated with the other parts of the primitive leaf as the wings of petioles and as lateral-basal portions of leaf-blades.

One of the most omnivorous parasites of the vegetable kingdom is our common dodder (*Cuscuta Gronovii*). Its favorite host plant is the goldenrod, upon several species of which it is nearly always to be found; but I have found it also on the red maple, blackberry, pepper-bush (*Clethra*), and some asters. That it should attack a plant with such thick bark as the maple is both interesting and remarkable. It would be interesting to know upon how many other species of herbs and shrubs this plant has been found parasitic.—*Willard N. Clute, New York City.*

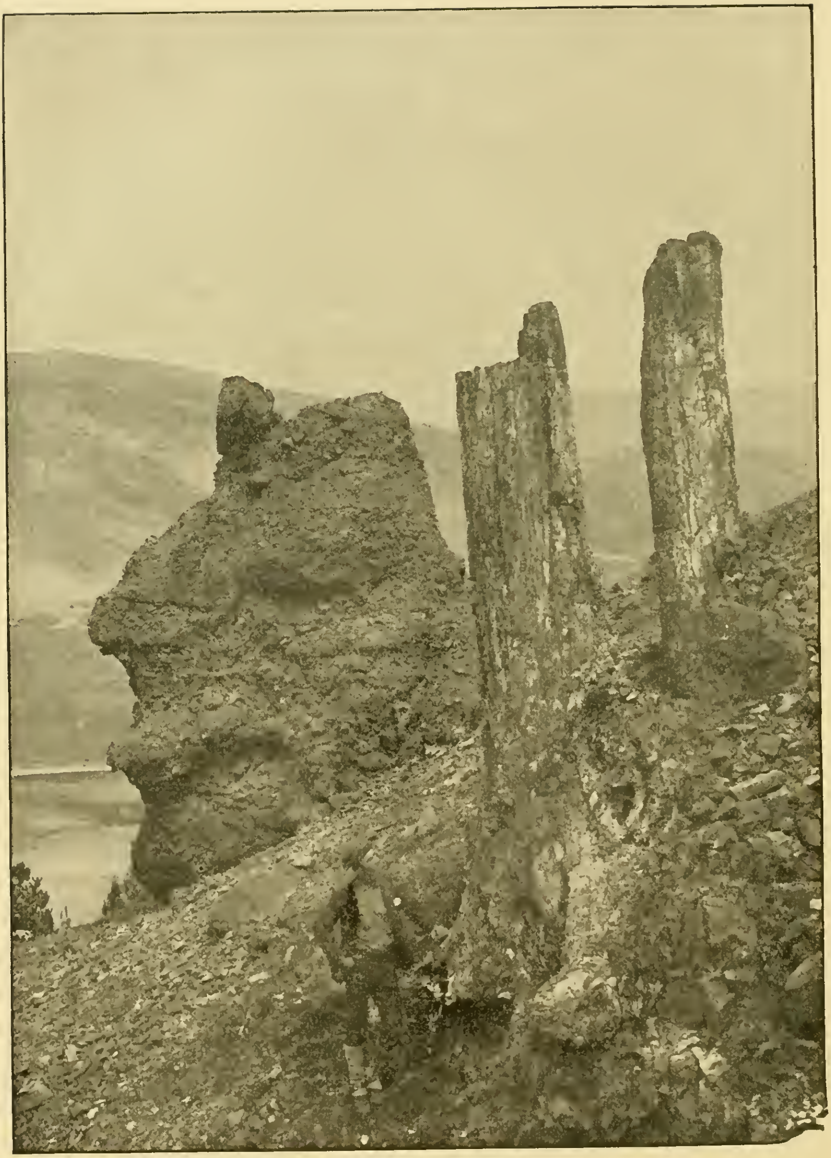
THE STANDING FOSSIL FORESTS OF THE YELLOWSTONE NATIONAL PARK.

By F. H. Knowlton.

THE Yellowstone National Park is called the Wonderland of America, and since the destruction of the New Zealand geyser area, it is, perhaps, entitled to be called the wonderland of the world, for within its limits the most varied of Nature's workings may be observed. Its hundreds of hot-springs and geysers, its precipitous cañons and rushing cataracts, its snow-capped mountain peaks and mirrored lakes, make it of surpassing interest. The lover of natural scenery may linger long over its beauties and wonders.

Of the various wonders, perhaps none is more remarkable than the fossil forests of standing trunks. These forests are located in the northeastern corner of the Park, at a place known locally as Amethyst Mountain, or Fossil Forest Ridge. This is really a mountain some ten miles long, and rising nearly, or quite, two thousand feet above the general level of the valley. If it were possible to cut a section down through this mountain, as a slice is cut from a loaf of bread, there would be found a succession of at least fifteen fossil forests one above another. That is to say, at some remote day, geologically speaking, there grew a great forest which was covered up by the ejected material from a gigantic volcano, rivaling in size Mt. Etna, that is known to have existed some ten miles to the north. The trees were entombed in an upright position, and under the action of silica-charged water, were fossilized. The action of the volcano ceased, and quiet was restored for a sufficient length of time for a second forest to be developed above the first. Then came a second outburst from the volcano, and this forest was buried and fossilized like the first, and so in turn have the dozen or more forests flourished and been entombed.

Then came the final quiet, the rumbling of the volcano ceased, and its fires were extinguished. But immediately the action of the elements began, and the wearing forces of rain and frost, acting through long ages, have carved out this mountain, in the heart of which may be read the story of its origin. This denudation appears to have been unaccompanied by any of the violent movements so often characteristic of mountain building, and consequently when the softer material is worn away from around the trunks, they stand upright in the exact positions in which they grew originally.



STANDING FOSSIL TREES IN THE YELLOWSTONE NATIONAL PARK.

The most wonderful of all the forests is exposed on a hillside, too steep to support vegetation. The largest tree, which must have been a very king of its race, stands guard on the summit of the hill. It is 26½ feet in circumference and 14 feet in height, with roots as large as the trunks of ordinary trees, imbedded in the solid rock. Just below this giant are two trees nearly 9 feet in circumference and about 20 feet high, the ones shown in our illustration. From this point on the hillside are scattered about hundreds of trunks from 1 to 8 feet in diameter, and from a few inches to twenty feet in height. One of the very largest was prostrated before it was fossilized, and is exposed for over 40 feet. Both ends are concealed, and consequently its length cannot be determined. Almost all of these trees are perfectly preserved, even to the bark, which in some cases is five inches thick.

It should not, of course, be supposed that these trees are preserved entire, that is, with branches and leaves attached. They consist only of trunks and roots, but in the rocks all about the trees there are impressions of branches, leaves, and even cones and fruits, that must have belonged to them. By studying these impressions, as well as the beautifully preserved internal structure of the trunks themselves, a very satisfactory idea may be formed as to the appearance they must have presented while living. Those with the thick bark were conifers like the sequoias, or "big trees," of California, and quite likely were their direct ancestors. Others were like our common trees, that is, such as oaks, chestnuts, beeches, elms, maples, magnolias and lindens. The trunks shown in the plate are coniferous. The only living trees found in the vicinity of the fossil forest are pines and spruces and two kinds of cottonwood, a fact which teaches clearly that the climatic conditions must have changed greatly since these fossil trees were living.

Dr. S. E. Jelliffe has just published [Bull. Torr. Bot. Club, **24**: 480.] a list of twenty-eight species of moulds and yeasts found floating in the air in his laboratory in New York City.

The Washington Mycological Club has been organized with a view of bringing together all persons interested scientifically or economically in the study of fungi. The principal objects of the Club are the identification and classification of fungi, particularly the larger and fleshier sorts, and to study the edible species and the noxious and poisonous kinds likely to be mistaken for them; to arouse a greater interest in, and a wider appreciation of, these plants as a source of food, and to gather and disseminate information regarding edible and injurious kinds by means of exhibitions, lectures and publications, and to make a special study of the fungus flora of Washington and vicinity.

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

IV. THE LILIES AND THEIR ALLIES.

VERY few plant-families exhibit so wide a diversity of habit among their genera as the Lilies and related herbs. The group is a large one, and as treated by the English and many German systematists, it comprises nearly 190 genera, which together form the aggregate known hitherto as the Liliaceæ of Lily family. The modern tendency among our botanists, however, is to recognize three distinct families; the true lilies, (*Liliaceæ*), the Bunch-flowers (*Melanthaceæ*), and the group to which belongs the Lily-of-the-Valley (*Convallariaceæ*).

The Liliaceæ proper contains considerably over a hundred genera and about 1300 species. The plants are chiefly herbs, growing from bulbs or corms, with leaves varying greatly in size and shape. The flowers are distinguished by having a conspicuous colored perianth, the divisions of which, six in number, are either quite free from each other, as in the Lily and Tulip, or united below into a tube, as in the Hyacinth. The ovary is almost invariably free, that is, not coherent with any part of the floral envelope; and it becomes in fruit a few- or a many-seeded capsule. Of course there occur exceptions to these general characters, as in other large families; thus the Star-grass (*Aletris*), has the perianth partly adnate to the ovary, while in some species of Yucca the fruit is not capsular, but fleshy and berry-like. Again, although the vast preponderance of genera consist of herbaceous plants, some of them are trees of quite imposing height. It should be stated that in all three of these families the stamens are 6 in number; and there is rarely any material distinction in color between the inner and outer divisions of the perianth (corresponding to calyx and corolla in the higher plants).

The Lily family is noteworthy as containing a large proportion not only of our most beautiful wild flowers, but also of the various exotics which we cultivate for early blooming. Thus the little squill (*Scilla*) hangs out its blue bells with the first soft breaths of spring, and is followed in quick succession by the showy Tulips and Hyacinths, the Fritillarias and the stately Crown-imperial (*Imperialis*). In the woods at about the same season blossoms that exquisite flower which has so long staggered under the unmeaning and inaccurate name of "Dog's-tooth Violet," as if anything in the floral world could be more remote in appearance as well as structure than the lily and the true violet. The plant is sometimes, but not often, called by the quite appropriate term "Adder's Tongue," but it might be still better called what it is, namely, an Erythronium. The Lilies of the field and garden (*Lilium*), the old-fashioned Day-lilies (*Hemerocallis*) and the tall Yuccas are too well-known to need more than a passing comment. I presume that the onion, however, would scarcely be admitted as a true Liliaceous plant except by botanists. Nevertheless it belongs there, and the small flowers, when examined under a lens, are really quite lily-like in appearance.

The Bunch-flower family (*Melanthaceæ*) is of less interest to the student of popular botany. The flowers are as a rule, not showy, and the withered perianth usually adheres to the ripening capsule instead of falling off like that of the true Lilies, giving the plants a decidedly seedy aspect. The root is not often bulbous, but mainly thick and tuberous; and the leaves are for the most part long and narrow. This family contains no trees or shrubs It includes about 36 genera and 150 species, of wide distribution. In our country the majority occur in the South, where the pine-barren bogs form their favorite haunts. Probably the most familiar plants of this family are the wild hellebore (*Veratrum*) and the bellwort (*Uvularia*), the latter, unlike its congeners, having pretty, nodding yellow flowers. In our gardens the fall crocus (*Colchicum*) is well-known for its peculiar habit of blooming in the fall without any leaves.

The Convallariaceæ, or Lily-of-the-valley family, furnish us again with some beautiful and conspicuous examples. These too are all herbs, and they grow without exception from rootstocks instead of bulbs. The leaves are usually broad and veiny; the perianth is variously shaped and colored. The chief distinctive character is found in the fruit, which is a fleshy berry. A good example of this fruit may be seen on the Solomon's seal (*Polygonatum*) in midsummer. That important succulent vegetable known as Asparagus belongs to this family, and oddly enough the little Smilax with which we decorate our tables and bouquets is also a member of the genus Asparagus In all the species of this genus the true leaves are reduced to little scales, and the leaf-like organs which we perceive in the Smilax are called phyllodia. Thus they are functionally leaves, but structurally branchlets. The Lily-of-the-valley (*Convallaria*) and the Clintonia, both of which grow wild in the southern Alleghenies, are two exceedingly ornamental members of this family.

In connection with the Smilax it may be well to point out that the little Smilax so-called, of the florists, the leaf-structure of which we were discussing, is botanically not a Smilax at all, but a Myrsiphyllum. The genus Smilax includes the well-known Cat-brier or Horse-brier, whose thorns have brought many a sinner to repentance. The Brier family (*Smilaceæ*) though closely allied to the foregoing families, is not of sufficient interest to warrant more than a passing comment. Its chief member is Smilax, which contains upwards of 200 species, mainly tropical. The plants are nearly all shrubby vines, the stems often prickly, the flowers small and inconspicuous in umbellate clusters borne in the axils of the leaves. The sexes are separate, that is, the staminate flowers are borne on one plant, and the pistillate on another; the fruit is a berry.

In the next paper I shall discuss the Irises, the Amaryllids and their relatives.

INFLUENCE OF LIGHT ON THE FORM OF PLANTS.

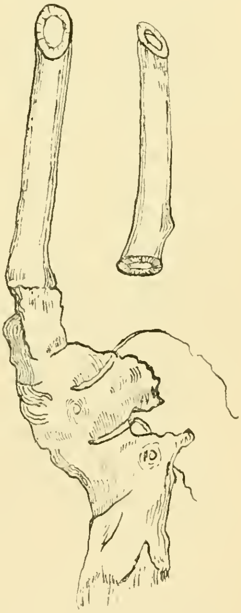
THE effect of the light-supply in determining the form of plants is well recognized. If a grass seed germinates under a tub, the little plant does not spread out at random in its growth. If the edge of the tub is raised to admit a ray of light, instead of growing upright, as it naturally would, the shoot bends toward the ray of light and grows by the shortest path to the opening. After passing into the full light it develops its normal form. The form and direction of growth of every branch is determined largely by the accessibility of light. The form and structure of every leaf also are just as largely dependent upon the light-supply. Innumerable differences in the shapes of individuals of the same species are caused by the struggle to obtain light. Branches develope in positions where their leaves can be unfolded to the light with the least obstruction. The natural round and full symmetry of the tree grown in an open place is due to the unobstructed action of the light on branch development. Trees have developed their habit of lofty growth by a continuous struggle to secure light. The same inciting cause has led to the development of the habit of twining in certain plants. Other plants have so modified their structure that they are able to secure sufficient light in the shade of the forest. Sleep movements of plants are other well-known reactions of light. In cultivation, the necessity of light is well recognized, and our plans for planting fields and gardens are made with reference to the plants used in order to secure the necessary light and nutrition for the best development of each individual.—*Herbert J. Webber in "Year-book of the U. S. Department of Agriculture for 1896."*

PSORALEA TENUIFLORA AS A TUMBLE-WEED.

By Lester F. Ward.

IT is well known that the Psoraleas are often tumble-weeds, but being perennials, they must differ in this respect from most other tumble-weeds, which are annuals and blow up by the roots.

While operating in Southwestern Kansas during September and October last, where the *P. tenuiflora* is very common, I took particular notice of this point. Before leaving the field many of them had begun to blow across the plains, and, besides good herbarium specimens, I collected the basal portion of the stems of some of the larger ones that had become detached, and I observed that the point of separation was always very close to the ground and had a uniform character. There are several points near the base where it looks as though there were nodes, there being a slight elevation all round the stem. It is at one of these, perhaps always the lowest one, that the detachment takes place, and in such a manner as to show a perfectly even surface in the cross-section. The stems have the appearance when lying on the ground of having been neatly cut off by a fine saw, and a closer inspection shows that the plane of separation is almost as smooth and even as if such were the case In some cases there seems to be a slight concavity on the distal side of this plane, leaving a corresponding convexity on the proximal or root portion. In other cases this is scarcely apparent.



It is obvious that the separation takes place at a natural joint, and that this is a provision of nature expressly adapted to the function of distributing the seeds. It is effected in such a way that the tissues along the plane of the joint disintegrate at precisely the proper stage in the development of the pods to secure the greatest degree of success in carrying the plant to remote distances under the influence of the wind, and thus scattering the seed broadcast over the plains.

Whether more than one joint on the same plant has this function could only be proved by further investigation; certainly there are always two that have the same general appearance, and sometimes a third, and it seems probable that these are developed to increase the certainty, so that if for any reason one of them fails another will succeed in dismembering the plant.

THE BAOBAB TREE.

THE Baobab or Ethiopian Sour-Gourd, is one of the largest, and certainly one of the most grotesque trees in the world. Its height is from forty to seventy feet, and not at all in proportion to the size of its trunk, which sometimes attains the great diameter of thirty feet. It soon divides into branches of great size which bear a dense mass of deciduous leaves somewhat like those of the Horse-Chestnut The flowers are large, white, solitary, and pendent on long stalks, and when expanded are about six inches across. The fruit is an oblong, woody capsule, covered with a short down, and from eight to twelve inches long, in appearance somewhat like a gourd; laterally it is divided into eight or ten cells, each filled with a pulpy substance in which the seeds are immersed.

The Baobab, known botanically as *Adansonia digitata*, of the Mallow family, is a native of many parts of Africa, and is cultivated in many of the warm parts of the world. It has been called "the tree of a thousand years," and Humboldt speaks of it as "the oldest organic monument upon our planet" Adanson, whose name the genus bears, and who traveled in Senegal in 1794, has given an account of this tree. He made a calculation to show that one of them, thirty feet in diameter, must be 5150 years old. He saw two trees, from five to six feet in diameter, on the bark of which were cut to a considerable depth a number of European names; two of these were dated, the one in the 14th, the other in the 15th century. In 1555 the same trees were seen by Thevet, another French traveller, who mentioned them in the account of his voyage.

The bark of the Baobab furnishes a fibre which is made into ropes, and in Senegal is woven into cloth. The wood is soft and subject to the attacks of a fungus which destroys its life and renders the part affected easily hollowed out. Livingston speaks of a hollow trunk within which twenty to thirty men could lie down with ease. The pulp of the fruit is slightly acid, agreeable, and often eaten.—*Treasury of Botany.*

I have just completed the manuscript of a *Catalogue of the Cretaceous and Tertiary Plants of North America*, which includes 2631 species and varieties. The last catalogue of similar scope, published by Prof. Leo Lesquereux in 1876, embraced only 706 species, thus showing that the flora of these horizons has been nearly quadrupled in the last twenty-one years.—*F. H. Knowlton, U. S. National Museum.*

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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SOME of the users of the more recent manuals of botany express a difficulty in readily 'finding things;' that is, having become familiar with the sequence of groups in the older manuals it was easy to turn to well-known forms, while in the late books the arrangement is new and strange and nothing is in its accustomed place. They ask why these changes were made.

In order to answer this question it will be necessary to give a brief history of botanical classification, for it is a step in this history that is involved.

Beginning with Theophrastus (B. C. 371), who divided the 500 species of plants known to him into Trees, Herbs and Shrubs; and Dioscorides (A. D. 77), who divided all plants into Trees and Herbs, we find that the first attempt at a true classification was made by Gesner of Zürich (1516–1565), who pointed out the fact that the way to discover the affinities of plants was to study their flowers and seeds. Gesner's work was taken up by Cesalpini in Italy, thirty years later, and the actual foundation of scientific botany was laid. Ray in England (1682–1703) first established natural orders or families, and Tournefort in France (1694–1700) first defined genera as we now understand them Linnæus (1753) established binomial nomenclature, and devised an artificial system based on the stamens and pistils which became the accepted arrangement for nearly a century. Linnæus well recognized the purely artificial nature of his system and attempted to formulate a natural disposition but made a practical failure of it, and it was not until 1789 that a true natural system was worked out by A. L. de Jussieu. He established one hundred orders and arranged all known plants under them, beginning with the most elementary. In 1819 De Candolle, another distinguished French botanist, published an arrangement of plants which reversed that of Jussieu, inasmuch as it began with the higher and ended with the lower forms. It is this classification, or some slight modification of it, that has been in use for the last fifty years or more. The manuals of Torrey, Wood, Gray and Chapman are arranged on this system, and it has therefore become as familiar almost as the A B C's. It is the displacement of this system that occasioned the protest stated in the first paragraph.

During all the years that the Candollean system has been in use, facts have been accumulating in paleontology, histology and morphology, which made it clearer and clearer that this was not a perfect or logical arrangement. It was shown to be wrong in many particulars, to be based on insufficient data, and the time was ripe for a new dispensation which came in the form of an epoch-making work known as *The Natural Families of Plants*, by Engler and Prantl, two eminent German systematists. They have made a rearrangement of the entire vegetable kingdom, beginning with simplest and passing to the more and more complex, a system which is undoubtedly to be, at least in its main features, the system of the immediate future. It is thus seen that this new classification is not revolutionary and useless, but is simply a step in the progress of botanical science that was demanded as an expression of the present state of our knowledge. Without such steps botany would stand still.

.... NOTES AND NEWS.....

Notwithstanding the fact that the orchids form a vast group, numbering some four hundred genera and between five and six thousand species, they are usually rather scarce plants; that is, they are rarely so abundant as to become dominant elements in the landscape. This is the more remarkable from the fact that they are known to produce seeds in the greatest abundance. Thus according to Darwin the little English orchid (*Orchis maculata*), which is not greatly unlike our little *Orchis spectabilis*, produces as many as 6,200 seeds in capsule, and as a plant often bears thirty capsules, the total product would be 186,300 seeds. This is insignificant when compared with certain exotic species. Scott found that the capsule of an Acropera contained 371,250 seeds, and judging from the number of flowers, a single plant would sometimes yield above seventy-four millions of seeds Müller found 1,756,440 seeds in a single capsule of a Maxillaria, and the same plant sometimes bore half a dozen such capsules, or about 10,500,000 seeds. Darwin estimates that if the seeds all came to maturity, the great-grand children of a single plant of *Orchis maculata* would clothe with one uniform green carpet the entire land surface of the globe. Will not some of our readers undertake to investigate the seed-producing powers of our native orchids, and give the results ?

Mr. Eugene P. Bicknell has just announced his discovery [Bull. Torr. Bot. Club, 24; 528.] of a new species of Wild Ginger, which he names *Asarum reflexum*, that has hitherto been confounded with the common *Asarum Canadense.* The new form has the calyx-tube white within and the calyx-lobes flat and reflexed and abrubtly acuminate at the apex into a straight obtuse point. The old name (*A Canadense*) now applies to the form in which the interior of the calyx-tube is purple nearly down to the base, and the calyx-lobes spreading and revolute, passing gradually into a slender, upcurved acumination. Other differences also exist, and are well brought out by the excellent figures given.

"Where the mosses abandon the scale of colors, the lichens take it up. Although usually of a gray appearance, or of a greenish-yellow, there are some that are a vivid yellow or even orange color. One will sometimes note a stone wall that looks like a sort of palette upon which Nature has tried her brushes. Upon it will be seen a strange confusion of lines, resolving themselves into a wild harmony. The pigments are not yet ready for the painting of a cardinal flower. It is with a few faint, tremulous touches of color that the artist first begins. She works up through anemones, violets and columbines, to the full splendor of the summer or the glory of the autumn."—*W. W. Bailey, in "Among Rhode Island Wildflowers."*

All who visit Nantucket express surprise at the number and variety of plants to be found on the little, hilly, sand-blown island. One sees many dooryard friends in the clovers, plantains, wild mustard, wild parsnips, fall dandelions, burdocks, etc. The bogs and roadsides near the beach were interesting collecting grounds. Here in grassy bogs grows the cranberry, with its little shining, bright-green leaves and conspicuous terminal berries, which become quite ripe in September. Just on the borders of these bogs and growing in great profusion is the sweet-smelling, glossy-leaved Bayberry, Wax Myrtle or Sweet Bay, mixed with which one finds the interesting little Choke Cherry. Bordering the meadow fences near the low beach is the fragrant-flowered Pepperbush, its racemes of white blossoms reminding one somewhat of the wild cherry. The sandy meadows and lawns are well sodded with handsome grasses which gradually grow coarser and thinner as we reach the shore. The coarse, harsh Seamat-weed grows to within a few feet of the water's edge. Its roots and shoots are so strong that it takes a hard pull to dislodge them Among this grass, forming dense patches, is the bladdery-looking Sea-Rocket, while its near neighbor, the pretty little Beach-Pea, grows in thick masses over the dry sand. Perhaps the most attractive grass found in meadows was the Purple Eragrostis (*E. pectinacea*), its long, graceful, purple plumes being in fine contrast to the surrounding green. There were a number of sedges, the prettiest one being the so-called Wool-grass, which grows along roadside ditches or drains to a height of some three feet. One meets with a number of introduced or ballast plants such as Dusty Miller, Great Willow-herb and Evening Lychnis. In little patches closely hugging the sand grows the Carpet-weed and its red, succulent neighbor the Sea-side-Spurge. It is said that there are two patches of Scotch heather (*Calluna vulgaris*) on the island, but the natives carefully guard the locality and scowl at all intruders. This has dainty pink blossoms. There is also, near the cranberry bogs, a pretty pink-flowered Polygala or Milkwort (*P. polygama*) which bears some of its flowers buried beneath the ground. These have no petals, but ripen their fruit as well as the showy ones above. They are called "cleistogens."--*Flora N. Vasey, U. S. National Museum.*

. . . BOOK REVIEWS . . .

A TEXT BOOK OF GENERAL BOTANY. By Carlton C. Curtis; pp. 359, New York: Longmans, Greene & Co., $3 00

Good text-books of botany are by no means rare, and a new aspirant to favor must be of superior excellence to find an audience beyond its author's class-room. It needs but a cursory examination, however, to show us that Dr. Curtis's work has been well planned, carefully digested, and well written. It represents essentially the course in laboratory work that is required of beginners in botany at Columbia University, in which institution the author is instructor in botany. The book is divided conveniently into four parts or chapters. The first deals with the anatomy of the plant body, from the cell and its contents to the intricate products of cell formation and growth. The second part is devoted to plant-physiology, and gives a brief outline of the most important facts on this subject. The third chapter is by far the larger, embracing over 250 pages. It is devoted to systematic botany and plant morphology, and consists of a short account of the entire vegetable kingdom taken up by families from the simplest to the most complex. It is especially full in the lower forms, of which the author is a well-known student. The concluding chapter is a short account of the paleontological history of plants

The illustrations appear to be all new and are a welcome relief from the figures that have been doing duty in our text-books for so many years. The paper and typography are excellent, and altogether the book is a welcome addition to our list of text-books. F. H. K.

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THE FLORA OF ARTIFICIAL LAKES IN NORTHERN NEW YORK.

By W. W. Rowlee.

IN a paper recently published in the *American Naturalist* [31: pp. 690–699; 792–800. Aug., Oct., 1897.] the writer described in some detail the topographic features of Oswego County, N. Y., and the influences which that topography has had in determining the distribution of the species of flowering plants of that region. It was pointed out in that paper that most of the streams in the county are sluggish and flow through long stretches of swamps. Here grow many plants that are generally confined in New York State to the shores of larger streams, and beyond the limits of the State occur mainly in the swamps of more southern latitudes.

In a few places in the county, and indeed throughout that part of the State, dams have been built in order to secure water power for saw-mills. Two of these dams form what are locally known as Jennings pond at East Palermo, and "Long Pond" in the southwestern part of the town of Williamstown. The dams in these two cases are made of earth and stone and have retained the water at a fairly constant level for many years. It is the effect of the permanent inundation brought about by these dams that I shall attempt to describe here.

In a survey of these ponds, two very striking features at once impress one. First, the very small number of species of plants occurring in them, and second, the luxuriance and abundance of the individuals representing each species.

In both, as indeed in all the ponds of the region, the same species occur. These species grow also in the streams above and below the ponds, but in the streams they occur only here and there, their abundance apparently being largely determined by their ability to hold their own against the other plants of the swamp. The creeks, as has already been said, are slow-flowing, a rod or two wide, and the tangled growth of brush and large herbaceous plants is so dense and vigorous along the banks as to frequently meet in the narrowest places. When the ponds were made, the level of the water was raised five or six feet, or in times of high water even more. The whole swamp above the dam was submerged to this depth, making of it a shallow, extensive pond. Each of the ponds mentioned above is more than a mile in length and varying from a few rods to half a mile in width. It is perfectly evident that there was no natural expansion of the stream in width in any part of the pond.

The trees of the swamp and the great majority of the shrubs were killed outright and now only the stumps show above the surface of the water. The trunks lie embedded in the mud at the bottom of the pond. The aquatic species that grew in the creek immediately improved their opportunity to spread into all parts of the pond. The Swamp Loosestrife (*Decodon verticillatus*) and the Button-bush (*Cephalanthus occidentalis*) occupy the shallower parts of the pond to the exclusion of almost everything else. They are particularly abundant in the northern part of the Jennings pond where they completely cover the ground that is usually covered with water but is occasionally dry. Here they cover, all told, many acres. In the deeper portions the Hornwort (*Ceratophyllum demersum*) literally fills the water. So thick is the mass of plants that they seriously interfere with a boat. The Water-shield (*Brasenia purpurea*), the Yellow Pond Lily (*Nymphæa advena*), the sweet-scented White Pond Lily (*Castalia odorata*), and the Pond-weed (*Potamegeton natans*) are very abundant in the ponds wherever the water is deep enough to support them. Some other species occur but none of them have "run wild" to the same extent that the species enumerated have.

Before the ground was submerged, there had accumulated upon it considerable quantities of humus, or muck. When vegetation on the swamp was killed by overflowing them, an inviting bed was made for the aquatics of the creek. A skilled gardener could scarcely have made a more perfect aquatic garden than here exists. The plants found food in abundance—virgin soil to them at least—and as a result the ponds afford an instance of aquatic plants spreading beyond their original confines in a manner very analogous on a small scale, to weeds when they invade cultivated fields.

Cornell University.

Mr. John Donnell Smith, the well known authority on the flora of Central America, has a valuable paper in the December number of the *Botanical Gazette*, in which he describes a number of interesting new plants from Guatemala and other Central American republics.

A CURIOUS METHOD OF PROPAGATING TREES.

By Charles A. White.

UP to twenty-five years ago a very large part of the surface of the state of Iowa was prairie, and the early settlers there had great difficulty in obtaining sufficient wood for fuel and other purposes. Their principal source of supply was then the scanty growth of trees that usually fringed the water courses; but perceiving that this supply would be speedily exhausted, they soon began tree cultivation. They thus quickly discovered that a crop of trees could be grown upon the fertile prairie soil no less certainly than could a crop of corn, the only question being as to the time required to make a wood-crop available.

The growth of those trees which furnish the best quality of wood is comparatively slow, rapid growing wood being usually of poor quality. The Cottonwood (*Populus monilifera*), which was one of the commonest trees which grew along the streams referred to, is of such low grade but its growth is so rapid, even upon upland prairie soil, that the settlers chose it for first cultivation in preference to other kinds which grew there. They practiced three methods of its propagation, one being the transplanting of young trees, one the sowing of seed, and the other the curious but effective method of planting poles.

At the time of year when cottonwood trees shed their seed the streams along which they grow are usually bank full, and as the seed falls into the water as well as upon the ground, it floats and lodges along the shores. If the soil is good there the seed quickly germinates and produces an abundance of seedling trees, most of which, however, fail to mature. If the shore is a sandy slope the floating seed collects in small ridges at the water's edge, but does not successfully germinate there. The settler often transplanted upon his land the minute seedlings found at the water's edge, as well as those of larger growth. He also gathered the seed-laden sand from the shores and sowed it upon a cultivated field, thus making a nursery of young trees to be transplanted at his convenience to artificial groves.

But the least laborious, and a very successful, method of propagating the cottonwoods was that of pole-planting. Having plowed his land for a grove, the settler ran furrows across it, leaving sufficient space between them for the proper growth of the trees. He then went to the bottom lands and cut and trimmed poles of young cottonwood having a diameter of from two to four inches. With his ax he cut notches down to the center of each pole, two or three feet apart.

The notched poles were then laid in the furrows, end to end in a single line. Then another furrow was run along each side, the cast of the plow covering the poles completely with soil, and the work was finished.

The cottonwoods, like the willows, are readily propagated by setting the lower end of cuttings in the moist earth. In such cases the cutting becomes a perfect plant with no other addition than that of new roots. That is, in such cases epitropous action only is necessary to make the cuttings a perfect plant, but as it takes some time for nature to adjust the new condition to the old, the growth of such a reconstructed plant is, at first, usually somewhat slow.

In the case of the planted poles, however, both epitropous and apotropous action take place together in the cambium layer at points adjacent to each notch made by the ax. That is, both branch and root buds are quickly formed there beneath the moist soil and clusters of suckers soon appear above ground. Only the most vigorous of these suckers were allowed to grow, and they became trees sooner than would either seedlings or cuttings under the best conditions. Their growth is probably aided by the sap supplied by the buried poles.

The conditions which gave origin to this remarkable method of propagating trees have mostly passed away in the region where I witnessed it, but the traveler there now often sees tall artificial groves of rectangular shape and with straight rows of trees, which had the origin just described. The rectangular shape was due to conformity to the section lines of the government land surveys, and the straight rows indicate the places of the pole-planted furrows.

Smithsonian Institution.

In my botanizing rambles I have found twenty-seven species of spring plants that bloom in autumn, and have no doubt that a longer search will reveal the fact that all the spring plants occasionally do so. Some families of plants have apparently half fallen into this habit of thus blooming twice in a year, as the violets, of which one can always find flowers in October; but others are less impulsive and it is a greater prize when we find them. The most recent addition to my list of flowers that bloom out of season is the common Indian-pipe (*Monotropa*), which was found in bloom on a crest of the palisades on October 30th. Beside it, stiffly erect, stood the seed capsule of its midsummer flower. What made this find memorable was the fact that in the company was a great German botanist who had come out on this excursion to see what rarities our woods afforded, and was much pleased with this species which he had never seen before.—*Willard N. Clute, New York City.*

THE EFFECTS OF TROPICAL SUNLIGHT ON PLANTS.

By D. T. MacDougal.

EVERY botanist who visits the tropics is impressed with the greater intensity of the sunlight and the numerous adaptations of plants by which damage from such fierce insolation is avoided. The very prominence of such adaptations generally leads to the overestimation of both the intensity and amount of light received from the sun in the tropics. According to Wiesner's researches, the greatest intensity of the sunlight at Buitenzorg is 1.612 units against 1.5 units at Vienna. The total daily amount of light received at Buitenzorg on days in November and December does not exceed that at Vienna in August, and the daily amount at Buitenzorg in January is equal to that of Vienna in June, the greater length of the day in higher latitudes compensating for shorter day with fiercer light in the tropics.

These generalizations may be taken to hold good for moist tropical climates only. In such dry climates as that of the Liguiana plain in Southern Jamaica, where the low humidity does not allow any great atmospheric absorption of the more refrangible rays, the total daily amount is probably greater than in average temperate latitudes.

A recent writer, Dr. A. J. Ewart, has made a valuable contribution to the subject.*

Dr. Ewart has found that the activity of chlorophyll is greatest between 25 and 35°C, and that it varies to 40°C and decreases steadily from 40°C to 50°C. In normally exposed plants the optimum temperature is maintained by the evaporation from an abundant supply of moisture, and by varying the angle of the leaf-surfaces to the light by pulvinar and passive drooping movements as well as by layers of red or violet coloring matter.

Thick leaves of shade-loving plants, such as Hoya, fastened in such position that the sun shines perpendicularly on the surfaces, may attain a temperature of 45 to 50°C, and suffer injury in consequence.

The necessity and importance of being able to move the leaves rapidly and accurately has led to the development of motor organs, pulvini, in many groups beside the Leguminosæ, in which such structures are most highly developed. Pulvini are to be found in many of the Monocotyledons, in which it is a greater variation than in Dicotyledons.

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* The effects of tropical insolation. Annals of Botany, II. : No. 31, p. 439. 1897.

An interesting adaptation is shown by some of the members of the genus Phyllanthus. The genus embraces nearly a score of species in which the leaves are reduced to bracts, and the leaf-functions are carried on by phyllodes, in which the transpiring surface is very limited. In such species movements are not necessary, since the edges of the phyllodes are directed nearly toward the sun, and the danger from the fiercer heats is not encountered. In *P. Niruri* and other species the leaves are arranged laterally in two ranks on the horizontal branches, in such manner as to resemble the compound leaf of Lathyrus, the monœcious flowers springing from the axils and depended below giving the appearance of an equally pinnate leaf bearing flowers. The oblong-ovate leaves are joined to the secondary branches by pulvinar structures, by the aid of which a closure may be made resembling that of the leaflets of *Cassia chæmæcrista*. Furthermore, the secondary branch and its leaves behave exactly as a compound leaf, being irritable to light, impact and shock, besides showing both thermotropic and nyctitropic movements. The genus is regarded as one of the oldest of the Euphorbiaceæ, and the particular species under consideration must have undergone a long series of migrations and climatic changes. The true leaves were found useless or uneconomical in certain cases, and these organs were gradually degraded until they are but minute bracts, while branches were slightly broadened to serve the functions of the leaf. *P. Niruri* is an example of the class retaining the leaves. In order to do this, however, it organized a branch and its leaves as a compound leaf, thus securing the power of regulating the light and heat falling upon the surfaces. Physiologically, the branch and its leaves is a compound leaf.

The uses of color in plants in the tropics have received much attention in recent years. As a result of some recent researches at Buitenzorg, Stahl concludes that red or violet color in leaves is for the purpose of raising the temperature and increasing transpiration. If this were true it would be expected that leaves in shaded and moist situations would exhibit the most color. Observations by Dr. Ewart in Java and Ceylon, and by the writer in Jamaica and the Rocky Mountains, show that the reverse is true, however.

Ewart found that the amount of color in the vegetation of the mountain of Gedeh was greatest at the base and decreased toward the summit, where the air was near the saturation point. The writer found that the shoots of young trees in the fierce glare of the sun on the mountain-sides in Jamaica up to 2,000 feet exhibited a marked coloration. Above this the coloration becomes more infrequent, but is shown by a few ferns at 4,000 feet, and is almost wholly absent from the plants of Blue Mountain peak (7,340 feet), which is wrapped in mist a great part of the time. Ewart found coloring in abundance in the vegetation on the summit of Pangerango (10,000 feet) in a very dry atmosphere, and the writer has noted confirmatory facts in the mountains of Arizona and New Mexico.

The "screen" theory that the coloring matter is designed to protect the chlorophyll and plastic substances of the plant against intense sunlight, is borne out by the above observations. The colors of leaves serve other purposes as well, which the writer has discussed in detail in a work now in press.

University of Minnesota.

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

V. FROM PALM TO PINEAPPLE.

IN order to approximate more closely the natural sequence of families this paper will be devoted to a number of small groups clustering about the Liliaceæ, and in the next issue of Plant World we will discuss the families announced in the last issue, completing the Monocotyledons.

The Palms (*Palmaceæ*) are so well known that the term "palmlike," whether applied to a leaf or the trunk of a tree, is to most persons self-explanatory. Equally, moreover, do we associate the palms with the tropics, and with good reason, since the vast majority of the 140 genera and 1,000 species are confined to the warmer regions of the globe. Of the few which reach our borders in the extreme southern Atlantic states several are dwarf plants with prostrate or subterranean trunks. The handsome genus *Neowashingtonia* is native in southern California. Whether native or exotic, a palm is always recognizable from its peculiar leaves, and as the infloresence is not often observed we may pass over the family without detailed explanation of its characters.

The Aroids (*Araceæ*) are a most interesting group, with great diversity of habit and structure. Most of the genera are tropical, but our native forms are familiar to every student of nature. Who has failed to welcome the skunk-cabbage as the earliest harbinger of spring, albeit execrating the plant at the same time for its suggestively disagreeable odor? The curious hoods, scarcely peeping out of the ground, are called spathes. They envelop the spadix, which is a fleshy spike packed with small and inconspicuous flowers. This spadix, subtended by the leafy spathe, is characteristic of the Araceæ. The flowers sometimes have a fleshy perianth, and sometimes, as in the quaint "Jack-in-the-pulpit," consist of bare stamens and pistils, the latter occupying the base of the spadix and ripening into a mass of red berries. The leaves of Aroids are of a rich green color, often very large and ornamental, as in the common cultivated Elephant's Ear (*Colocasia esculenta*) of our lawns. In the Calla Lily (*Zantedeschia Æthiopica*) the large, pure white spathe and bright yellow spadix very effectively imitate a single flower of some Liliaceous affinity. When the structure of the spadix is once understood the student will have little difficulty in recognizing such plants as the Sweetflag (*Acorus Calamus*) as belonging to the Araceæ, although here the spathe from its position appears to be a mere prolongation of the stem.

In the Duckweeds, or *Lemnaceæ*, we find the smallest known flowering plants. They are supposed to be degenerate Aroids, and consist merely of a little disc-shaped, leaf-like and free-floating body, rarely exceeding one-third of an inch in diameter, and bearing on the under surface a single stamen or pistil and several minute rootlets. There are but three genera and only twenty-five species known throughout the world. In our stagnant pools and ditches *Spirodela polyrhiza*, the Large Duckweed, is often abundant, covering the surface with a carpet of green. In another genus, *Wolffia*, we see the plant body reduced to a little grain scarcely larger than a pin's head. What a contrast between this and the giant Sequoia ot the Californian forest!

The Yellow-grass family, (*Xyridaceæ*) will manifest itself chiefly to the one who tramps over a southern pine barren at midsummer. These plants have slender, grass-like stems, terminated by a dense spike of brownish scales or bracts, from the axils of which appear a few small, evanescent, bright yellow flowers. The structure of the sepals and petals is most beautiful, but very complicated, and can be studied advantageously only by a botanist. The stems are occasionally twisted like a corkscrew, whence one of the species is called *Xyris* torta. The family contains but two genera, and most of the species are tropical.

Passing over the inconspicuous Pipeworts (*Eriocaulaceæ*), denizens of our fresh water ponds and swamps, with their globose, whitish heads of minute flowers, we come to the *Commelinaceæ*, or Spiderwort family. This contains numerous tropical genera, but none occur in the United States except Commelina and Tradescantia, both of which are cultivated in old gardens. The flowers are a rich, deep blue in most of the species, and they remain open only in the sunshine. In Commelina one of the petals is much smaller than the other two. In this family also we have the flowers subtended and at times partially enveloped by a leafy spathe.

Every fisherman knows the Pickerel-weed (*Pontederia*), which, with its wand-like spikes of blue flowers and handsome cordate leaves, affords shelter for many a fine fish. The *Pontederiaceæ* is not a large, family containing only a few genera. It is of interest, however, from the fact that it contains the Water Hyacinth (*Piaropus*), that pretty plant of cultivation which is proving such an obstruction to navigation in the St. John's river, Florida. The family may be distinguished from the Commelinaceæ by its six-parted perianth, all the divisions of which are similar instead of being in two series corresponding to sepals and petals.

The *Bromeliaceæ*, or Pineapple family, is a group of considerable economic importance, as it includes that luscious fruit of the South, the pineapple. A large proportion of the plants belonging to this family are epiphytes, growing upon the trunks of trees, and in our country restricted to southern Florida. The well known Long Moss (*Tillandsia usneoides*) which ornaments the live oaks so effectively throughout the southern states belongs here. Its small flowers, with their dry, husky perianth, are apt to be overlooked among the tangled strands of the foliage, but they are good objects for study.

BOTANIZING IN THE FOSSIL FOREST.

By Myrtle Zuck.

AT first glance things look very unfavorable to the collector of plants in Chalcedony Park in Arizona. One is surrounded by badlands, and the ground is strewn with the mummies of great pine trees. But over there is a dry, sandy warh, along the banks of which may be found something interesting.

One of the most conspicuous plants is a tall grass, *Calamovilfa longifolia*, which the Mexicans call *carrizo*. Several species of Atriplex, commonly known as Saltweed and Sagebrush, are abundant. Nestled under a small shrub (*Atriplex canescens*) is a dainty plant with white flowers and queer little flat pods—the "spectacle-fruited" mustard, *Dithyrea Wislizeni*. Near by is the graceful, swaying *Petalostemon candidus*, the spikes of creamey white flowers exhaling a delicate fragrance, something rarely found in these flowers of the desert. A gorgeous bit of color attracts one's attention, and one finds the Indian pink or Paint-brush, as the Castilleias are variously called. Though its flowers are inconspicuous, the brilliant red bracts that subtend them give the plant a beautiful and striking appearance. Growing in the sand are some small plants of *Anogra albicaulis*, an evening primrose with white flowers turning to rose color.

Back on the mesa among the rocks are many Eriogonums. One species, with its grayish stems and leaves, rose-colored flowers and diffuse habit, and another, dressed in dark green and yellow, seem too dainty for their environment.

The Compositæ we have always with us, and this region is no exception. Gutierrezia, Aplopappus, Bigelovia, Aster, Erigeron, Zinnia, Artemisia, Senecio and many other genera are represented. Here and there is a patch of grass, enough to be called "fine feed" by a cowboy, although one cannot but wonder how stock manages to exist with such scanty supply. Species of Sporobolus and Panicum are found, but the commonest grasses are of the genera Epicampes, called sacaton, and Bouteloua, of which there are several species.

NOTES UPON THE GROWTH OF STEMS AFTER BEING CUT.

By Byron D. Halstead.

THE very evident elongation of the stems of Scarlet clover (*Trifolium incarnatum*) after having been cut and placed in a vase led me to make a series of measurements of the elongation with this species and that of some other long, rapidly growing flower stalks.

The test was made by cutting and at once placing the cut ends in water, after which the stems were marked off into half inch spaces by using India ink applied in narrow lines with a camel's hair brush, and the stems returned to the vase of water. The following are some of the results with the Scarlet clover:

No. 1. Twenty-six half-inch spaces were marked off, or a total of thirteen inches, on Saturday morning, May 15th. At the end of five hours the marked thirteen inches had elongated to thirteen and a half inches. A week later the marked portion of the stem had elongated to seventeen inches, or a total increase of four inches!

This increase was confined to the upper six spaces or three inches, and embraced the upper internode and upper half of the one below it as follows: the first internode below the head from ½ inch to 2⅓ inches; the second internode from ½ to 1⅜ inch; the third (just above the node) from ½ to ⅝ inch; the fourth internode from ½ to ⅔ inch; the fifth internode from ½ to 1¼ inch, and the sixth internode from ½ to ¾ inch.

Another upper ten inches of a Crimson clover stem elongated to fourteen inches, or an increase of four inches, as in the last case. The increase was confined to the upper 5 inches as follows:—

First upper half-inch grew to 2¼ inches.
2nd " " " " " 1¼ inch.
3rd " " " " " ¾ inch.
4th " " " " " 1¼ inch.
5th " " " " " ¾ inch.
6th " " " " " ¾ inch.

A flower stalk of salsify was marked for its upper six inches and it increased in length a half inch, all of which was confined to the upper third of the marked space. The same was true of others of the same species.

The flower stalks of *Ranunculus bulbosus* showed the same slight increase as salsify.

A flower stalk of Narrow-leaved Plantain (*Plantago lanceolata*) elongated one inch in the upper five inches of the marked stem and the largest amount was in the upper-most half-inch space and the elongation decreased in the succeeding spaces until it was nothing at the third inch from the spike.

Rutger's College, Dec. 17th, 1897.

A NEW FOSSIL EUCALYPTUS FROM KANSAS.

By Lester F. Ward.

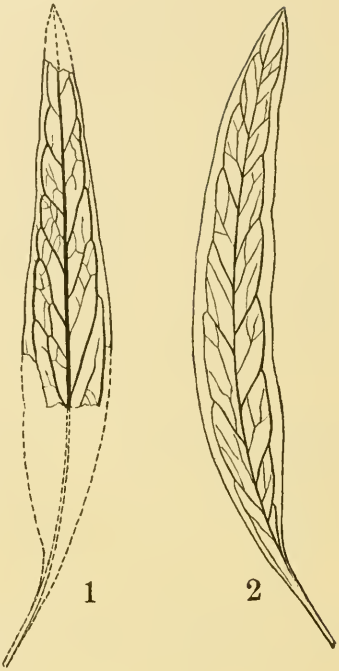
IN a small collection of fossil plants from the Middle Cretaceous (Dakota Group), of Clark county, Kansas, which was made by Mr. C. N. Gould and myself on Oct. 3, 1897, there occur several leaves that belong to the genus *Eucalyptus* One of these is entirely different from any of the rest and presents a nervation which at once marks it as a species new to science. Although it is not generally advisable to name species of fossil plants from single specimens, especially from one incomplete leaf, nevertheless, so exceedingly clear is the nervation in the present case, that there is no room to doubt either its generic affinity or its specific distinctness from all other species of the genus. So much of the material that has been called Eucalyptus, which has been reported from various deposits throughout the world, is of a doubtful character that it is desirable that any case involving no uncertainty be brought to the attention of botanists and geologists. I regard this as such a case and ventured to describe it in the December number of the *Bulletin of the Torrey Botanical Club* as a new species. I named it *Eucalyptus Gouldii*, in honor of Mr. Gould, who, as stated above, assisted in its collection.

Of all living species of Eucalyptus this approaches most closely in its nervation to that of *Eucalyptus largiflorens*, first described by

Baron von Müeller in 1854, and figured in his beautiful "Eucalyptographia," Decade V.

In the accompanying cut, Fig. 1 represents the fossil leaf, and Fig. 2 one of the leaves of *E. largiflorens*, having approximately the same size and shape as the fossil one, copied from the plate accompanying the description given in the work already referred to. The substantial identity of the nervation is apparent at a glance.

At the present day the genus Eucalyptus is found native only in Australia and the Indian Archipelago, but in this fossil leaf we have another link in an already long chain of evidence which goes to prove that the genus has had a long history, and was widely distributed over the globe in Cretaceous and Tertiary time, millions of years before man made his appearance.



I have verified the fact that the Sensitive Briar (*Schrankia*) will close its leaves if one stamps on the ground near it, but without touching it, whether from the current of air or dust or from the jar communicated through the ground I could not determine. I also observed that the wind does not seem to affect the plant; but if you hold your face near it or blow on it even very gently with your breath its leaves will close instantly.—*J. M. Milligan*, *Kerr County*, *Texas.*

"Columbus found cotton growing abundantly in the West Indies in 1492. He and other explorers found it equally abundant upon the mainland of the New World, and found the inhabitants of those countries using its fibre for the weaving of cloth, and showing considerable skill in its manipulation. Cortez found cotton in Mexico in 1519; he gathered it and used the wool to stuff the jackets of his soldiers to enable them to resist the arrows of the natives. Cotton was the chief article of clothing among the Mexicans, as they had neither wool nor silk, and did not use flax, although they possessed that plant. They made large webs from cotton fibres spun into yarn, as delicate and as fine as those made in Holland at that date."—*R. B. Handy*, *in* "*The Cotton Plant.*"

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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IN the January number an explanation was given of recent changes that have been made in botanical classification. These changes in limitation and sequence of groups were also, at least in certain botanical centers, accompanied by numerous changes in the familiar Latin names of many of our plants. In the present note it is proposed to give a brief account of this so-called nomenclature reform

Each known species of plant is designated at the present time by two Latin terms—a generic and a specific appellation. This system, known as that of binomial nomenclature, was carried into full effect in botany by Linnæus in the year 1753. Previous to that date plants were known by a generic name to which was appended one or several more or less descriptive terms. Thus a certain pine was known as *Pinus sylvestris maritima, conis firmiter ramis adhærentibus*. In the case of large genera this became exceedingly cumbrous, but reducing the number of terms to two simplified the matter greatly.

At the time Linnæus wrote comparatively few plants, less than 9,000 species, were known to science, but it marked the beginning of an era of great botanical activity, and vast numbers of new species were discovered in various parts of the world. It therefore naturally happened that when so many botanists were working independently they discovered and gave different names to the same species of plant. The wide distribution enjoyed by many plants aided in this duplication. The scientific name which came to be generally accepted for a plant depended upon a variety of circumstances. It might be the one given it by Linnæus or some of his contemporaries, or one of much later date. The size and circulation of the work in which a species was published, or the name and authority of the author were often deciding elements. Ignorance of the existence of more than one name also contributed to the result. But it usually happened that sooner or later a name would gain recognition, by one means or another, over the other names proposed for the same species, and come to be for a time the accepted designation. Yet now and then appeared an author who preferred one of the more or less unfamiliar synonyms for a species, and some confusion was the result.

It was at this point that the differences of opinion arose between the two so-called schools of botanists. The conservative element argue that a name which has been accepted for a long time—say for fifty years—and is woven into the literature of the science in hundreds of places, is good enough and should not be displaced. A name is only a convenient handle for a plant and not an essential part of it, and it is not worth while to be changing it. Moreover it is held that to change a long accepted name is to obscure its history. It may be a plant, the name of which has become very familiar to the public, and a change under such circumstances would be nearly equivalent to its destruction, at least until the new name became familiar.

On the other hand the radical or reform element claim that there can be no stability of names until we go back to the very first name that was given each plant after the introduction of binomials, that is after the year 1753. This was the starting point, and it is claimed that a plant must bear the earliest name that was given it after this date. It is admitted that it is unfortunate and often perplexing to change familiar names, but when once done thoroughly it is held to be done for all time.

The users of current manuals of botany may know that if they find no changes in familiar names the author of that book is a conservative in nomenclature, but if there are many strange names for familiar plants they may be assured that the book has been written by an adherent to the law of priority.

. . . . NOTES AND NEWS. . . . .

Mr. T. L. Hankinson, of the Michigan Agricultural College, reports having killed a ruffed grouse in the early part of September, which had attached to the feathers of various parts of the body more than fifty nutlets of the Stick-Seed (*Echinospermum Virginicum* or *Lappula Virginiana*). This shows how widely the seeds of plants may be distributed by animals.

"The railroads of this country are annually consuming 90,000,000 ties, requiring the cutting of 45,000,000 trees on the assumption that an average of two ties may be had from one tree. Fifteen trees to the acre suitable for making ties would be a full estimate, so that it will require the culling of 3,000,000 acres a year to supply this demand."—*J. B. Killebrew, Ph. D., in "The Forests of Tennessee."*

One of the Star-Thistles (*Centaurea solstitalis*), a weed of Southern Europe, is reported in the November *Erythea* as a very obnoxious weed-pest in California. It is known locally as "Buckthorn" and "Russian Thistle," and is hurtful to growing crops, and often kills horses which eat it after it has become matured and dry.

To get a better view of the world-famed ruins that surround the forum I climbed upon an ancient rostrum which still stands near the Basilica Julia—perhaps the same that Antony stood upon when he addressed the populace at Cesar's funeral. Glancing down upon a patch of dust soil which had been scraped from the via sacra my eyes met the upturned sunny faces of three old friends, the White and Red Clovers and the Dandelion. They quickened such memories of home that, for the moment forgetting Rome and all its ancient glories, I hurried down to give them greeting.—*Dr. C. A. White in a letter to the editor.*

"No problem of greater importance was ever presented to the American people than that of the preservation and reproduction of the forests of the country. The accelerating consumption of timber makes it a question of but a few years when the demand must be restricted or the supplies must be drawn from other countries than our own. At the present rate of consumption, a quarter of a century will see all our grand forests denuded of their most valued timbers. There are now more than $500,000,000 invested practically for the destruction of our forests, and not $50,000 invested for their preservation and reproduction. This simple statement shows the grave reponsibility resting upon the present generation."—*J. B. Killebrew, Ph. D., in "The Forests of Tennessee."*

In *Science* for January 7th Dr. Charles E. Bessey has an interesting account of the modern views regarding the functions of stomata or the so-called breathing pores of plants. After describing briefly the structure and mechanism of stomata he says: "It has been found that gases and water-vapor pass through the open stomata. In the case of gases the passage is in either direction, while it appears that the water-vapor passes in one direction only—namely, from the intercellular spaces outward. From the fact that the stomata serve for the passage of both gases and water-vapor have arisen two views as to their proper function, some botanists holding that they are organs of respiration, that is, breathing pores, while others regard them as transpiration organs, that is, organs for permitting the escape of surplus water from the tissues of the plant." He then points out the fact that when the stomata-bearing plants, which are now terrestrial, were developed from aquatic ancestry a division of labor was established whereby the roots absorb the water and solutions and the stems and leaves absorb the carbon dioxide necessary for growth. Aside from bringing in food solutions a certain amount of water is necessary from a purely mechanical point of view, in maintaining the proper distention of the cells, and anything, as for example a thickened epidermis, which tends to prevent the escape of water also prevents the absorption of carbon dioxide. A plant therefore might have a sufficient supply of water, but would starve for the necessary carbon dioxide. This difficulty was surmounted by the formation of stomata. When the stomata are open the carbon dioxide enters and is absorbed by the chlorophyll-bearing cells, and at the same time there is necessarily a considerable loss of water, but as soon as the cells cease to be properly distended the stomata close. From these phenomena Dr. Bessey concludes: (1). "That one of the functions of stomata is the admission of carbon dioxide to the chlorophyll-bearing tissues of the plant. (2). That the loss of water by terrestrial plants was originally hurtful, and is so now in many cases. (3). That if plants have utilized this constant phenomenon it is for the supply of food matters of secondary importance, as the salts in solution of the water of the soil."—*F. H. K.*

. . . BOOK REVIEWS . . .

A DESCRIPTIVE CATALOGUE OF THE USEFUL FIBRE PLANTS OF THE WORLD, INCLUDING THE STRUCTURAL AND ECONOMIC CLASSIFCATIONS OF FIBRES. By Charles Richards Dodge. Report No. 9 U. S. Department of Agriculture, Fibre Investigation. Washington: Government Printing Office, 1897; pp 361.

This is without doubt the most extensive and complete account of the useful fibre plants of the world that has ever been published. Its compilation has extended over a period of more than twenty-five years, and its author has spared no pains to make it as full as possible. It includes 1,018 species of useful fibres. These are arranged alphabetically, both under the common and botanical names of the fibre plants described, with numerous cross references, so that it is easy to refer to the desired species. Under the more important species the information given is very complete, including a description of the plant, its habitat and distribution, and the manner of producing the fibre as well as its varied uses. The book is illustrated by twelve full-page plates and over one hundred text figures of important or interesting species, and there are three short appendices describing fibre machinery, the identification of fibre, and there are a description and history of lace. The work should do much to stimulate practical research. It is unfortunate that the entire edition is exhausted.—*F.H.K.*

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

VOL. I. MARCH, 1898. NO. 6.

BOTANIZING IN THE DALLES OF THE WISCONSIN RIVER.

By Rodney H. True, Ph.D.

ALTHOUGH Mrs. Britton has introduced the readers of the PLANT WORLD, in its initial number, to this weird and enchanting spot, it may perhaps not be without interest should the writer tell somewhat more concerning the floral population of these picturesque gorges.

As one rows from Kilbourn City up through the Dalles, or popularly, the Dells, between the perpendicular sandstone cliffs which in places rise to a height of more than one hundred feet, the smooth faces of Potsdam formation exhibit most interesting sights. He who has an inclination towards geology will find his attention attracted by the strata sometimes as much as twelve feet in thickness, showing cross laminations terminated sharply both above and below by horizontally-bedded strata.

The botanist cannot fail at any season of the year to find these cliff faces and the damp, dark crannies, beneath frequent projecting shelves, of great interest. It was once my good fortune to walk on the ice through a part of this wonderful gorge and examine these surfaces. At that time of the year, of course, few of the higher plants could be studied to advantage. In places where the texture is sufficiently firm, the surfaces support a growth composed mainly of tufts of *Gymnostomum* and other mosses of similar habits. Certain thalloid liverworts, and the ubiquitous *Marchantia*, small ferns, *Pellæa atropurpurea*, and, more rarely, the dainty, fragrant *Dryopteris fragrans* were to be seen. The surfaces protected by overhanging shelves were fairly covered with a thick growth of *Gymnostomum* and, in places, with sheets of the rare Sword-moss (*Bryoziphium Norvegicum*). The purpose of my excursion was to collect, if possible, fruiting specimens of this latter moss or, if unable to find capsules, to ascertain something in regard to its time of flowering. It seemed not impossible that it might fruit early in the spring and lose its capsules when washed by the high waters of the spring. I was not successful in my quest, and determined to search again in the early spring. The sandy summits of these cliffs yielded a number of characteristic mosses. Patches of *Polytrichum piliferum*, beautiful green cushions of *Dicranum scoparium*, pale green ones of *Leucobryum vulgare*, small turfs at the bases of trees of *Thelia Lescurii*, and loose tufts of *Thuidium microphyllum Ravenellii*.

In the darker, lateral gorges, where the sun can hardly peep in, where shelving rocks make spots suggesting rare things, the Sword-moss is present in great abundance and a host of commoner things also luxuriate, among them many well-known mosses.

On returning the next spring to search again for the fruit of the Sword-moss, I once more met failure. I succeeded in finding an abundance of flowers as yet hardly mature, May 7, 1892, the antheridial flowers seeming much more numerous relatively than the archegonial. From my searches, therefore, I concluded that this moss fruits in the early summer and then, rarely. Professor Cheney, as Mrs. Britton has already related, succeeded in finding a fine lot of these capsules in perfect condition, some years later. The date at which these were found agrees well with the conclusion reached from the flowers found. Although recorded only as being found at the Dells, the writer has collected this moss from numerous similar situations in the range, called the Baraboo bluffs, from fifteen to twenty miles distant. Although failing to find the object of my search on the spring visit above mentioned, I was amply rewarded in another direction. The walls of certain of these cañons were found fairly monopolized by the beautiful little Bird's-eye Primrose (*Primula farinosa*) with its rosette of leaves pressed tightly against the moss carpet and its yellow-eyed flowers greeting one before most of its neighbors had fairly awakened. A glance into a spot where the sun shone into the gorge, discovered a rarer, if not more beautiful sight. A cluster of violets in full bloom in this cold place was a surprise, but to find here the Large-spurred Violet (*Viola Selkirkii*) with its big inflated spur, was still more remarkable. It is a rare plant in this part of the country, being characteristically a northerner. Perhaps this violet, adapted to a cold climate, had been more abundant in these parts in past times when the subsiding glaciers still influenced the seasons and, finding in these cold, damp cañons a situation fitted to its nature, has persisted.

At proper seasons of the year many other interesting things may be found in the Dells. Rooted in crevices in the more exposed sandstone places, the shrubby, yellow *Potentilla fruticosa* forms a conspicuous feature falling down over the rocks. Growing in similar but more shaded places near the water-line, the white *Sullivantia Sullivantii* is found in abundance. Likewise growing in crevices and straggling down over the perpendicular surfaces of the sandstone river-faces, Prof. L. S. Cheney and the writer found early in June of last year a dwarf shrub with rather showy, violet or purple, fragrant flowers. After several vain attempts, a fine specimen was obtained. A hasty examination indicated that we had a specimen of the Lapland Rose Bay (*Rhododendron Lapponicum*). This Rhododendron, according to the manuals, is an alpine shrub not noted as occurring in this part of the country, being reported from the higher mountains of New England and the Adirondacks of New York, and Quebec and Labrador to Greenland, thence west through arctic America to Alaska. It was here found in flower a month earlier than the time indicated. Professor Cheney has compared this plant with the herbarium material of the University of Wisconsin and believes the specimen in question to be properly assigned to this name. Perhaps the climatic changes above cited in connection with the Large-spurred Violet may also offer an explanation of this probably isolated occurrence. This plant is nowhere noted as being found in Wisconsin.

Much more might be written concerning this unique bit of country and its attractions for the botanist. Certain it is that, approached from almost any standpoint, the Dells will richly repay any one visiting its crags and cañons.

University of Wisconsin.

WITCHES' BROOM ON THE LOCUST.

By C. E. Waters.

OF the many curious deformations caused by the attacks of fungi on higher plants, perhaps none are more curious than the so-called "witches' brooms." These bunches of closely-packed, slender twigs, occurring on different trees, are caused by species of the genus *Taphrina*. Other species attack plum trees, causing the hard, hollow "pocket" plums, and still another causes the leaves of peach trees to curl. The mycelium, or vegetative portion of these fungi live in the tissues of the host plant, which they penetrate in all directions, and in which they pass the winter unharmed, ready to start a new growth at the return of spring. The presence of this mycelium in the woody portions of a tree cause a swelling of the tissues, and the formation of a large number of branches that spring from this swollen part. Since they are so closely packed together, the branches naturally are very slender and straight, and receive a portion of their name, at least, from their resemblance to a broom made of twigs.

Early in the summer of 1895, while walking in Anne Arundel County, Maryland, the peculiar appearance of two bushes by the roadside was pointed out to me by my companion. In a little hollow by the roadside, growing in sandy soil among the common weeds were two bushes with curious tufts of slender branchlets, and long slender pinnate leaves of unmistakably leguminous appearance, though entirely unfamiliar. The general aspect of the branches, with their characteristic prickly spines at the nodes, led at once to the suspicion that these were nothing but abnormal specimens of *Robinia Pseudacacia.* This was shown conclusively to be the case by the appearance of normal leaves last year. The leaves had the usual number of leaflets, but the latter were only about one-half their usual length and were not more than a fourth of an inch in width. These slender leaflets on the tufts of thin branches gave the bushes a very striking appearance.

Specimens were carried home and were shown to the late Dr. J. E. Humphrey, then lecturer in Johns Hopkins University, who at once said they looked like "witches' brooms." He made a thorough study of this material and of more brought in later, and to his surprise found not the slightest trace of fungus hyphæ or fructification in or on the tissues. Under the microscope, thin sections showed that the wood was very much gnarled and twisted, and a section through a node resembled somewhat a piece of bird's-eye maple. We must, therefore, ascribe the formation of so many adventitious buds and such abnormal foliage to something else than fungus enemies. Both bushes were formed of strong shoots from stumps cut off near the ground, but it does not seem likely that this cutting back could cause the great changes, especially as the shoots were apparently a year old. The following summer one bush was dead and the other had only a few abnormal leaves on it, but none of the usual size and shape. Last spring there were no abnormal leaves, and just a few that looked like those usually seen. Evidently the bush was in a very sickly condition and it is doubtful whether it will be alive in 1898.

The January number of the *Botanical Gazette* contains a portrait and biographical sketch of Dr. Julius von Sachs, the distinguished German botanist, who died May 29, 1897. He was one of the pioneers in the study of plant physiology and many a difficult problem owes its solution to him.

THE ADDER'S TONGUE FERNS.

By Elizabeth G. Britton.

AMONG the interesting and uncommon species of our native ferns we must include the Ophioglossums. Their antiquity is very great, since they, or some near ancestors, have been found fossil in the Permian age, which is just above the great Coal measures. A supposed true Ophioglossum is found in the Cretaceous clays of New Jersey, and also in Greenland. Their characters are so simple and they have such a wide geographical distribution, that they may well claim to be one of the oldest families, and to have reached a highly specialized division of labor in the differentiation of the fertile from the sterile fronds, a separation which has been carried so far in one exotic species, that they occur on different plants. We have in North America north of Mexico eight species, seven of which are true Ophioglossums, the eighth species belonging to the Cheiroglossa, which means hand-tongued, on account of the spreading divisions of the sterile frond; they are characterized by bearing the fertile spike on very short stalks at the base of the frond, and by growing pendent from the trunks of trees. In our *Ophioglossum palmatum*, there are one to sixteen fertile spikes on each frond, and they are quite small as compared with the size of the frond, which is sometimes longer than a herbarium sheet and often quite as broad, and is divided into several sharp tapering lobes, beautifully and clearly net-veined. It has been found only in Florida where it grows on palms and palmettos, and ranges south into Mexico and the West Indies to Brazil.

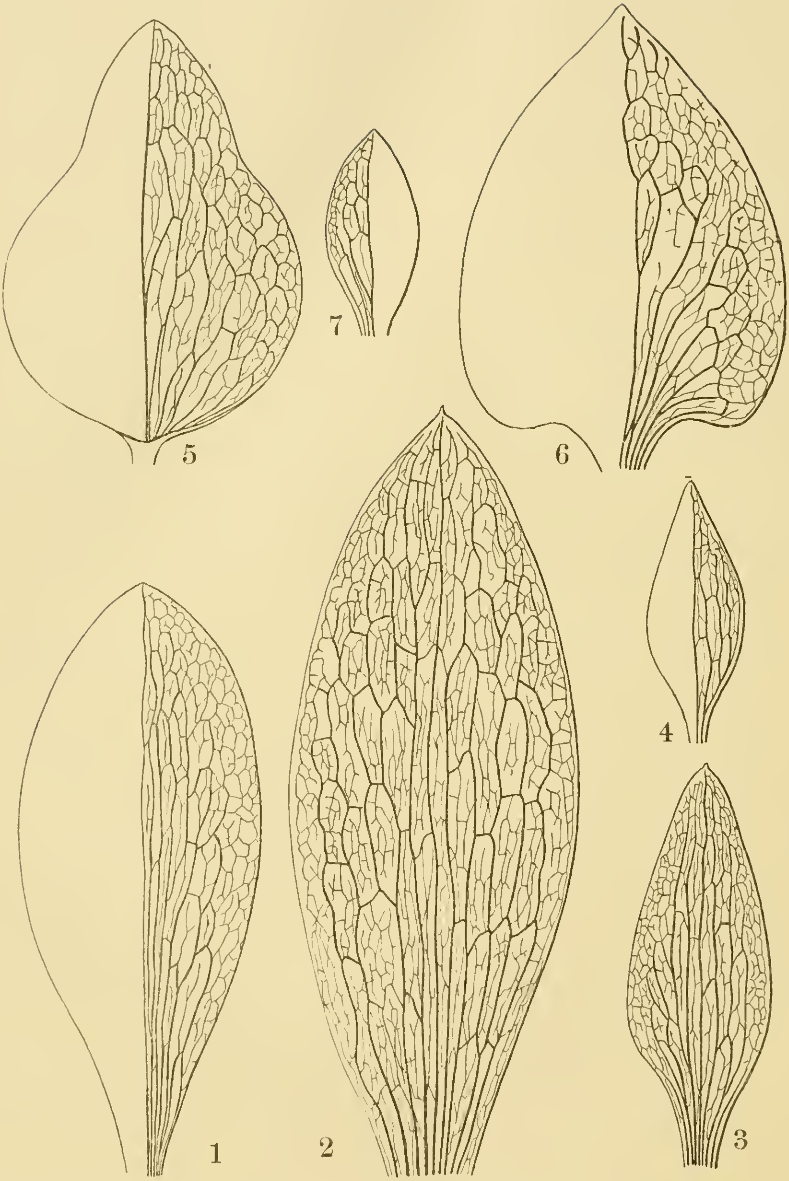
The true Ophioglossums have simple, undivided fronds, grow on the ground, and have a single fertile spike which arises from a common petiole with the sterile frond, and bears the spore cases (sporangia) in a double row at the top. The largest and commonest species is *Ophioglossum vulgatum*, which is known also from Europe and Asia and ranges through the Atlantic states from Maine to Florida and west of the Alleghanies in Kentucky and Tennessee. It is very variable in size and in the time of maturing its sporangia, as well as in the shape of its sterile fronds. Specimens measure from five to sixteen inches in height, with the fronds from one to six inches long, and in all shapes from ovate to elliptic and even linear, either obtuse or acute at the apex with the base long and tapering or broad and clasping. In Europe it seems to be almost as variable, though the prevailing form is ovate-acute with a clasping base. Nuttall, in his *Genera of North American Plants*, expressed the opinion that our American species was distinct from the European, and in his herbarium there are two specimens with the specific name *vulgatum*, crossed out on the label and *oblongifolium* substituted for it. These specimens are oblanceolate, with a blunt apex and a long narrow tapering base, and this is the commonest form of the species in the New England States. This form does not seem to occur among European specimens and perhaps Nuttall's name should be kept to indicate this variation.

Another species, somewhat smaller and less variable, is *Ophioglossum Engelmanni*, which grows in the Central States from Indiana to Texas, and though local and not abundant at any one place, has been collected at a large number of stations. It may be readily distinguished by its regularly elliptic frond, with a mucronate apex and large meshes with numerous included veinulets. The root-stocks are slightly thickened, as in *O. vulgatum*, and often bear several plants on each one. It is reported to grow on sterile and rocky soil at high and dry elevations, and will probably be found in the Alleghanies, as it has recently been found at Staunton, Virginia, and at two Mexican localities by C. G. Pringle. It was described by Prantl in 1884, but has not been included in any of our text-books, nor recognized by any of our fern students, though it had twice been distributed as a variety of *Ophioglossum vulgatum*, as long ago as 1871 and 1875.

A new species, having a very marked gregarious habit, was discovered on the third of July last by Mr. Joseph Crawford and Mr. C. L. Pollard, near Holly Beach, New Jersey, growing under oak, holly and cedar trees in open, sandy woods, not far from the beach. It was described and figured as *Ophioglossum arenarium* in the December number of the *Bulletin of the Torrey Botanical Club*, and specimens have been distributed by Mr. Pollard to many of the students of ferns in this country. Most of them agree that it is a distinct species, but Mr. George E. Davenport thinks it is a small form of *O. vulgatum*. It differs from that species in its smaller size, more rigid erect habit, usually two plants from each root-stock, and in the size and shape of the fronds, which are none of them more than two inches long and less than half an inch wide, lanceolate in shape with a blunt somewhat thickened, and cucullate apex. If water-pores are not known to occur in any species of fern, this would seem to be a similar organ for evaporation, as it terminates the vein and is thick and colorless. The venation also is less distinct in dried specimens than in *O. vulgatum*, as the fronds seem to be more fleshy, like all seaside plants, and the basal veins are fewer, forming narrower meshes and smaller areolæ toward the margins, and there are few if any free veinulets. The spores also are less distinctly marked and without the pitted appearance, like the surface of a thimble, which characterizes the spores of *O. vulgatum*, nor are they flattened and indented on the inner face and lack the three ridges, and trefoil markings of those of *O. Engelmanni.* The species seems to be sufficiently distinct, whether we adopt the Linnæan or the evolutionary view of a species, although it does resemble some of the dwarfed forms of *O. vulgatum*, and seems to be a connecting link between the members of that group and those of *Ophioglossum Lusitanicum*, which are smaller and have a gregarious habit.

Ophioglossum Californicum Prantl represents this last group in America, and has been known in our text-books and journals as *O. nudicaule.* Dr. C. C. Parry collected it as early as 1850 and sent it to Dr. Torrey, who mounted it and left it in his herbarium unnamed. Professor D. C. Eaton called it *O. nudicaule* when it was re-discovered at the type station near San Diego, California, by Cleveland and Parry in 1882, and singularly enough it was discovered at two other stations in the same year, by C. G. Pringle and M. E Jones, extending its range into Lower California and Mexico. That there are other new and undescribed species from Mexico, closely related in this group, I do not doubt, as Pringle has already discovered in Chihuahua, a species, which I believe to be distinct.

As for the name *Ophioglossum nudicaule* L., it belongs to a South African species collected by Thunberg at the Cape of Good Hope, and in the sense in which it has been used in our text-books should be cited as *O. nudicaule* Sturm in part. Five authors have applied the name to seven different species, of which our smallest species of the genus was one of the victims. Prantl, even as late as 1884, supposed it had no name of its own, but Nuttall, in 1818, described *Ophioglossum pusillum* from South Carolina, and his specimens are preserved in the herbarium of the Academy of Natural Sciences of Philadelphia, and are unquestionably what we have been calling *O. nudicaule.* There are two other specimens in Nuttall's herbarium also labelled *O. pusillum*, by some one else, presumably Schweinitz, according to a letter in Professor Eaton's herbarium from J. H. Redfield. But there is some ground for supposing that Nuttall had not clearly separated *O. bulbosum* Michx.,from his own *O. pusillum*, even though he cited them both on the same page directly following each other, because he says of *O. pusillum* that the frond is "cordate." However, even if *O. pusillum* is a mixed species, it is clear that he meant the name to belong to the specimens in his herbarium to which he signed his name "Nutt." and the other specimens have not his signature. This species is confined to the Southern states, ranging from South Carolina to Florida, Louisiana, and Texas, and *O. bulbosum* into Mexico, Bolivia and the Argentine Republic. Both are small



OUTLINE AND VENATION OF FRONDS IN THE NORTH AMERICAN OPHIOGLOSSUMS.

1—*O. vulgatum.* 2—*O. Engelmanni.* 3—*O. arenarium.* 4—*O. Californicum.*
5—*O. Alaskanum.* 6—*O. raticulatum.* 7—*O. pusilum.*

species, and Nuttall says of *O. pusillum*, "seldom more than one inch in height." Professor L. M. Underwood has also collected *O. crotalophoroides* (*O. bulbosum*) as small as this, though it often reaches four to six inches in size, and always has a larger cordate leaf, which with its bulbose root-stock are its most marked characteristics. Its earliest name, *O. crotalophoroides*, Walt. 1788, refers to the shape of the fertile spike, which suggests the rattles of a rattlesnake.

Another new species described by me in the December *Bulletin* is *O. Alaskanum*, collected on Unalaska Island by Turner. It belongs to the group of *Ophioglossum reticulatum*, a species which has not thus far been found north of Mexico; it has the frond cordate or reniform at base, and is usually ovate in shape, though the figures given by Presl show also a tapering base like the haft of a trowel. The specimens from Alaska evidently belong to this group, though the plants are not as tall, and the fronds are thinner, and neither cordate nor reniform, usually longer than broad, whereas in *O. reticulatum* they are oftener the reverse. In the accompanying illustrations the artist has unfortunately exaggerated the indentations below the apex, which do not occur in all the specimens of *O. Alaskanum*, but he has correctly indicated the difference between this species and *O. reticulatum.*

THE FAMILIES OF FLOWERING PLANTS.

By Charles Louis Pollard.

VI. FROM IRIS TO ORCHID.

WHEN this issue of the PLANT WORLD appears, the bulbs that were planted last fall in gardens and parks will be pushing their green shoots out of the ground, full of promise for the gorgeous display that is to come later on. Of this brilliant assemblage the Iridaceæ, or Iris family, will claim our first attention, since the Crocus, which is one of its prominent representatives, is often the earliest of spring flowers.

The Iridaceæ is a large family, with about sixty genera and over 1,000 species, widely distributed over the warmer parts of the globe. They shun the cold, and in our temperate climate we have besides the Iris only three small genera. On the other hand a large proportion flourish at the Cape of Good Hope, and many of them are endemic there. This fact is so well known to horticulturists that the term "Cape bulbs" is as ordinary a commercial term as "Dutch bulbs," which we found to include the hyacinth, tulip and Narcissus.

Cape bulbs include the Ixias and Sparaxis, with their delicate, harlequin-hued flowers; the Freesia, whose fragrant, drooping racemes are now often seen in florists' windows; and many species of Gladiolus, though not strictly belonging to this class, grow wild at the Cape, and in the skillful hands of the hybridizer, have given rise to our beautiful garden Gladioli.

The most prominent feature of the Iris family is found in the peculiar arrangement of the leaves, which are technically described as "equitant and two-ranked." The term equitant applies to the manner in which one leaf sits astride another, in the fashion of a man on horseback. It is well illustrated in the leaves of the common Iris or Flag. While the majority of the family grow from coated bulbs or corms (as in the Crocus), there are many genera in which there is no bulb, but a thick, knotty rootstock. The perianth-segments are in two series, often differing in color, but usually petaloid; the flowers are subtended by large, spathaceous bracts, which we may perceive upon examination to be analogous to the spathes of Aroids, discussed in the last paper.

The Amaryllidaceæ (Amaryllis family) contains many more of our spring-flowering bulbs, as well as several choice greenhouse forms. In its geographic distribution the family is similar to the preceding, but its genera are more numerous and its species fewer. Not over half a dozen genera are found in the Eastern United States. Among the examples seen in gardens are various species of Narcissus, the Snowdrop (*Galanthus nivalis*), the Snowflake (*Leucojum vernum*), and in greenhouses species of *Hippeastrum*, *Sprekelia*, *Vallota*, *Amaryllis* and *Atamosco*, all of which are sold under the composite name of Amaryllis. The family is distinguishable from the Iridaceæ by its nearly regular flowers, both series of perianth segments being similar; by the stamens, which are three instead of six; and the leaves, which are not equitant. While the root consists usually of a bulb, the Agave tribe have a thick, woody caudex, and in tropical climates become trees. An example of the genus Agave is seen in the well-known Century-plant (*A. Americana*). It is not, of course, true that the plant attains an age of one hundred years before producing flowers, but the development is slow, and after the plant has actually blossomed and fruited it dies outright.

In the Orchids (*Orchidaceæ*) we reach the highest type of monocotyledonous plants. The union of primitive parts is here most marked. The perianth, although its segments are distinct and petaloid, is coherent with the ovary; the usually single stamen is united with the pistil into what is called the *column*, and finally the pollen itself is coherent in pollen-masses or *pollinia*. The conspicuous part of the flower is the *lip*, which is a remarkable development of one of the inner perianth-segments; it forms the well-known pouch in the genus *Cypripedium*, and assumes in other orchids a great variety of fantastic shapes.

The family is an immense one, spread over all parts of the globe, but is particularly abundant in tropical regions. While a majority are epiphytic, growing upon the bark of trees and shrubs, the orchids of our climate are all terrestrial. Some of the species are such delicate and even insignificant plants that they would scarcely be recognized at the first glance as being related to the showy Cattleyas, Lælias, Oncidiums, etc., of our florists' windows. A very slight examination of the floral structure, however, is sufficient to distinguish an orchid from any other plant. Among our wild species the most beautiful, perhaps, are the Lady's-Slippers, purple and yellow (*Cypripedium*), the Orange and Purple fringed Orchids (*Habenaria*), and the dainty Calypso of northern bogs, the discovery of which is a delight and its study a revelation. Our native orchids are impatient of cultivation, and even the greenhouse varieties will thrive only under special treatment. It would almost seem that the plants appreciate the high position to which their structure entitles them among the great community of plant families.

THE TWAYBLADE IN CULTIVATION.

By Joseph Crawford.

THE photograph of the Large Twayblade (*Leptorchis liliifolia*) is not only a fine illustration of this beautiful native orchid, but it represents what can be done in the matter of house gardening with a very little trouble. The bulbous bases were potted under glass in the latter part of October and with scarcely any attention at all produced this vigorous growth of leaves and flowers in the early part of March following. The plant is specially adapted to house culture because of the ease in transplanting. The large, bulbous bases are mainly on top of the ground and have but few rootlets to be injured by the removal of the plant from the ground.

Then again it is one of the prettiest of our orchids. It is rendered particularly striking by its pair of large light, glossy-green leaves of beautiful oval shape, almost on the ground, and its ample or spreading raceme of dull red and green flowers. It is quite a model of neatness as well as of beautiful simplicity. I have tried a number of native plants with the same methods of culture that I applied to this, but done have given the success that this has.

Respecting this plant, and considering its beauty, it is quite a common thing to find it in almost all woodlands, but the only other representative of the genus in this section, the Fen Orchis (*Lpetorchis Lœselii*), is much less striking in appearance and very rare in occurrence.

The former is also one of the most gregarious of orchids being seldom found solitary but nearly always in groups of good dimensions and exhibiting all stages of growth and development from the small single-leaved plant to the most perfect one.

Whether this is due to perfect fertilization and the very local distribution of the seeds or from the branching of the bulbous bases, I cannot say, but I presume from the density of the colonies the latter method was more than likely the chief cause.

Its methods of fertilization are well worth study, and may give us some light on its propagation. There is no finer field for the student of insect-loving plants than the family of orchids. Let us hope for early observations respecting them.

My second find of the Fen Orchis was directly west of the city. On the Susquehanna, along a public highway and not over three feet from the wheel track, was a single specimen. Usually both species grow in protected situations.

Philadelphia, Jan. 13, 1898.

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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IT is perhaps hardly necessary to mention the fact that the character and scope of botanical instruction in our schools and colleges has changed greatly within the past fifty years. Formerly the higher or flowering plants were almost the only forms studied, and in these groups a knowledge of the organs of the plant and an ability to "run down" or analyze a species was practically the end of botanical research. The botanical leaders of the day were mainly engaged in describing the floral riches of a new country, and had little time for working out life histories. But gradually there came a change. The cell in its multiform phases, its development into tissues and tissue-systems, its morphological and physiological characteristics has become the dominant subject, in fact the pendulum seems to have swung so far in the other direction that the plant as such is almost lost sight of. We would not for a moment underestimate the value of this knowledge, for it is upon this basis of fact that rest the improvements in our systematic arrangement of plants or a logical understanding of the vegetable kingdom, but is it necessary that the plants as they occur in wood, field and stream, should be so totally ignored? It has been said that of the instructors and students in one of our great universities, not one knows the local flora. They are so busily engaged in cutting and staining sections and in noting the growth and development of the minutest organ, that the plant as an individual and a factor in the economy of nature is lost to view. Would it not give a broader or better rounded conception of the vegetable kingdom if the student became familiar with at least the types of the various groups, rather than have only a knowledge, however intimate, of a few isolated forms? It would seem that for the general student a judicious combination of both views would be advantageous. It will be a good foundation for specialization.

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THE readers of THE PLANT WORLD are earnestly requested to send to the editor notes and news items that may be of general interest. As was said in the initial number: "What has interested and instructed you may interest and aid others." Open the pages of your note-books and give your botanical friends the benefit.

.... NOTES AND NEWS.....

According to Dr. J. C. Arthur (Indiana State Report for 1896), formalin appears to be a satisfactory germicide for the prevention of potato scab.

Mr. J. G. Smith has just presented to the National Herbarium a collection of 142 drawings, chiefly of the achenia of Sagittaria. They are either small sketches or full-page drawings and were made by Mr. Smith while preparing his monograph on this genus published in the report of the Missouri Botanical Garden for 1895. These are to be mounted on the standard sized herbarium sheets and kept with the herbarium specimens of Sagittaria. A label giving the above data has been prepared to accompany each drawing.—*J. N. Rose, U. S. National Museum, Washington, D. C.*

According to Dr. Jacob Schneck of Mt. Carmel, Ill., as recorded in the January number of the *Botanical Gazette*, the Louisiana Naked Broomrape (*Aphyllon Ludovicianum*) is in that vicinity always found attached to the roots of the Great Rag-Weed (*Ambrosia trifida*). "The roots given out by the host, which connect the two plants are at first small, so that it is almost impossible to trace them to their destination. But they steadily increase in size, until they are often as large as a wheat straw by the time the parasite has run its course, which is usually about the last of September."

Mr. W. R. Dodson, of Baton Rouge, La., describes in the January number of the *Botanical Gazette*, the curious production of aerial tubers in the common potato. He says: "The plant had no well developed underground tubers, but the stem above ground had developed on it upwards of fifty well formed tubers, varying in size from a half inch to two inches in diameter. The tubers were located in the axils of normal leaves; in some instances there was only one tuber in the axil of the leaf, in others there were more, and in one case there were five. These tubers were of the shape and size of those ordinarily formed underground, but in many instances the leaf-scale of the normal potato was here developed into a large foliage leaf, which did not differ from the normal leaf of the stem." The tubers were planted the following spring, but were lost before coming to maturity. They seemed to be the same as the ordinary form.

On the afternoon of January 22d Dr. N. L. Britton found fully developed flowering spathes of the Skunk Cabbage (*Spathyema fœtida*) in the marsh of the New York Botanical Garden. Considering the latitude this is remarkably early blooming for even this earliest of spring flowers. Some are inclined to attribute the circumstance entirely to the mild winter, but the majority believe that this is only an indication of what may be expected when the Botanical Garden is fully established.—*Willard N. Clute, New York Botanical Garden.*

Mr. James Gunson described before a recent meeting of the botanical club of the Michigan Agricultural College the manner in which *Phlox panicula'a* distributes its seeds. The calyx when ripe becomes dry and paper-like, and spreads out in the form of a saucer. The thick-walled pistil opens from the top into three pieces with a snap, spreading open so far against the calyx, that it is torn from the brittle attachment, scattering the seeds as well as the worthless fragments of the pistil in every direction.

One of the western Morning Glories (*Ipomœa leptophylla*) is well known on account of the production of an enormous fleshy tap root, which sometimes weighs as much as 100 pounds. According to Mr. George L. Clothier, who writes in the January number of the *Botanical Gazette*, this species appears to be frequently propagated by the development of new plants from slender roots: "The propagating roots originate from various parts, more abundantly from the lower part of the vertical fleshy root, pass out horizontally for a short distance, then rise to near the surface of the ground several feet away from the mother plant, where adventitious buds are produced. * * * Each young plant, while still connected with its parent, sends down a fusiform, fleshy root, which penetrates the soil to a depth of three or four feet."

The Agricultural Experiment Station of Cornell University has issued a series of leaflets beginning in December, 1896, as a guide to teachers in directing the observation of children to natural objects. The first one is by Professor Bailey, on "How the Squash Plant Gets Out of the Seed." It is intended for indoor work in winter and the children are expected to grow the plants for themselves, and are encouraged to gratify that inborn love for pulling them up to see how they are getting on and replant them again to give them another chance. This leaflet is illustrated by fourteen cuts and carries the observations to the point where the true leaves are already partly developed. The various points to be noted and recorded are carefully described, and the definition at the end is this: "Natural Science consists in two things: Seeing what you look at and drawing proper conclusions from what you see."—*E. G. B.*

I notice under "Notes and News" in the December number of the Plant World, a note relating to the branches falling from the Cottonwood, and the conclusion that this was a device for multiplying and spreading the species. Several years ago the attention of the Philadelphia Botanical Club was called to the dis-articulation of the branches of the Cottonwood (*Populus monifera*) and also of the White Oak (*Quercus alba*) by that observing botanist, Benj. Heritage of Mickleton, N. J. The conclusion reached was: that this was a provision of nature to dispose of the now unnecessary branchlets and without leaving a knot. When a boy, there stood in my father's yard a large White Oak tree, which in the fall, cast a large quantity of these dis-articulated twigs. We thought then, as now, that it was a way of self-pruning and without leaving a knot to decay. With the Cottonwood, these twigs *might* grow, under favorable circumstances, but it is not likely that those from the White Oak would.—*C. D. Lippincott*, *Swedesboro*, *N. J.*

... BOOK REVIEWS ...

Reference List of Publications Relating to Edible and Poisonous Mushrooms. By Miss Josephine A. Clark. U. S. Department of Agriculture, Library Bulletin No. 20. January, 1898.

This is a valuable list of publications relating to a subject that is every day growing in importance. It may be obtained by application to the Secretary of Agriculture.

Laboratory Exercises in Vegetable Physiology. By Dr. J. C. Arthur. 8-vo; pp 32. Kimmel & Herbert, Lafayette, Ind.; 35 cts.

This little pamphlet contains full accounts of some thirty-five experiments in plant physiology, being both qualitative and quantitative work illustrating important phases of the subject. It is adequately illustrated, and will undoubtedly be found of much value in class-room work.

Journal of the National Science Club, Washington, D. C. January, 1898; pp. 26.

This appears to be the initial number of a journal that is to be, the organ of the National Science Club, a club with headquarters in Washington, D. C. It is, however, without a volume number, although there are internal indications that it is to be a serial publication. There are three interesting botanical articles: "Leaf-variation," by Mrs. W. A. Kellerman; "The Ways of Climbing Plants," by Mrs. Mary E. Treat, and "Edible Mushrooms," by Mrs. E. C. Anthony. The publication seems to lack proper editorial supervision.

THE PLANT WORLD

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VOL. I. APRIL, 1898. NO. 7.

STUDIES AMONG OUR COMMON HEPATICÆ.

By Alexander W. Evans.

INTRODUCTORY.

UNDER the name Hepaticæ, it is customary to group together plants which differ so markedly among themselves that it is difficult, if not impossible, to frame descriptive characters which will apply to all. These differences, which affect both the gametophyte and the sporophyte, are so profound that it is more convenient to split up the group at once into its three well-marked orders and to consider these separately, rather than to attempt to treat it as a whole. While doing this, however, the interrelationships between the orders must not be overlooked and will be pointed out as our studies advance.

About nine-tenths of all described species of hepaticæ belong to the order Jungermanniales, and characteristic examples of these will be studied first, not only on account of their great preponderance, but because their simplest representatives are the most primitive of all hepaticæ, and their most highly developed show, in certain respects, an approach toward the mosses. In the simplest genera, the gametophyte is "thallose," that is, it consists of a flattened axis or thalloid shoot without any differentiation into stem and leaves; in the more highly developed, such differentiation is clearly apparent, and the plants are therefore spoken of as leafy or "foliose" hepaticæ and also as "scale-mosses." These two extreme conditions are connected by intermediate forms.

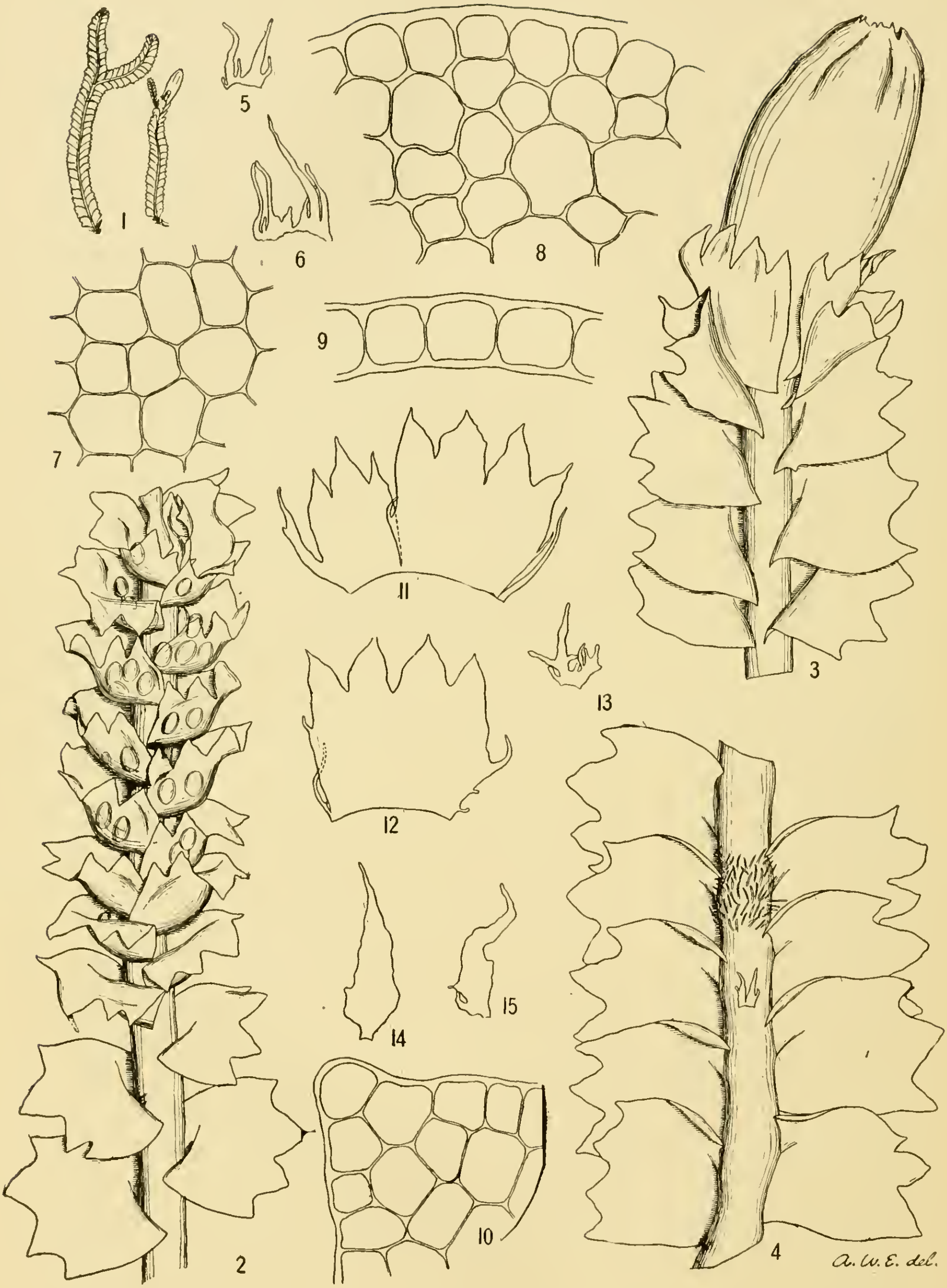
Material of the leafy species may be prepared in much the same way as in the mosses; it should be freed as far as practicable from the substratum and dried under very little pressure. After the dried material has been soaked in water for a few minutes it is ready for study and may be examined directly in water; permanent preparations are most easily preserved in glycerine or in glycerine-jelly, and the plants are often much clearer in these media than they are in water. In studying the leafy forms, it will be found impossible to tear off the leaves at their insertion, as may often be done with the mosses. If this is attempted, the leaves will be sure to tear across irregularly. It becomes necessary, therefore, to dissect them off carefully under the dissecting-microscope with fine scalpel-needles, or else to examine them while still attached to the stem. When the leaves are not crowded, this can be done directly; when they are crowded, the stem may readily be cut (under the dissecting-microscope) into short sections, each bearing only one or two leaves.

The leafy hepaticæ are most numerous in damp, shaded localities, such as ravines, where they prefer rocks, banks and rotten logs. More detailed notes regarding their habitats will be given under the different types described.

I. JUNGERMANNIA BARBATA SCHREB.

In the mountains of New England and New York and in our northern regions generally, *Jungermannia barbata* is one of the commonest of all hepaticæ, but toward the south it becomes much rarer and soon disappears altogether. Like many of our other northern species, it is widely distributed, occurring in both Europe and Siberia. As a habitat it prefers damp, shaded rocks, but it may be looked for also on rotten logs and on banks. It is a rather large species, the robust stems being sometimes 3$^{cm.}$ or more long and, with the leaves, 2$^{mm.}$ wide. The simple or sparingly forked stems and the flat leaves with their curious teeth usually enable us to distinguish the species at a glance from all the other large species which grow in similar localities, except certain of its immediate allies. *J. barbata* may be looked upon as the type of a specialized group of Jungermanniæ, which the older botanists regarded as a single, very variable species; the botanists of the present day, however, find here rather a half dozen closely allied species, certain of which are still connected by transitional forms. If it happens, therefore, that specimens are found which agree pretty closely but still not exactly with the description given below, they are probably referable to one of these related species. In studying our first hepatic, attention will be directed mainly to the vegetative characteristics of the plant. The reproductive bodies, which are all very uniform among the foliose species, will be considered at a later time, and in other plants.

Juugermannia barbata usually grows in flat tufts of considerable extent, the stems being closely appressed to the substratum; in rarer cases, the stems are ascending or even erect and the tufts become thicker. In color the plants are a darker or lighter green according to the degree of shade in which they grow; when exposed to direct sunlight, they become tinged with yellowish-brown. The stem itself is in the form of a cylinder, which is slightly flattened from above downward; from the lower surface is given off a thick felt of pale rootlets which soon lose their living contents and apparently serve simply to hold the plant in place. If the stem is studied in thin transverse and longitudinal razor-sections, which can readily be cut in pith, it will be found to be built up of a mass of cells which are closely packed together without any intercellular spaces, a well-developed stem being fifteen or more cells thick. The cells making up the interior of the stem are considerably larger than the others and are three or four times as long as they are broad; they have colorless contents and thin, transparent walls, and they fit together by blunt ends. On the upper surface, there is a single layer of short green cells whose outer walls are thickened, but not pigmented, while, on the lower surface, there is another layer of short cells with thickened walls, which usually become reddish as they grow older. The rootlets proceed from the cells of this layer as simple, hollow projections, and the interior cells neighboring them frequently exhibit, to a less extent, a similar thickening and pigmentation of their walls. The stems normally branch by forking. The leaves are alternate and are arranged in two rows, one on each side of the stem. They are attached by a very broad base, and the line of insertion is strongly oblique and curves about the stem in such a way that the lower margin of the leaf is toward the apex of the stem. When the leaves are close together, as is frequent in this species, the lower part of each leaf comes to lie underneath the upper part of the succeeding leaf, an arrangement which is called "succubous" and which is of considerable systematic importance. At the stem-apex where the leaves are undeveloped and closely crowded, the stem curves slightly upward and lifts the apical bud away from the substratum. The leaves are broad, more or less quadrate in outline, and, at the broad apex, divided into three or four obtuse or subacute teeth or lobes, which extend about a quarter of the distance toward the stem and are separated from one another by broad sinuses. Except for these lobes the margins are entire and are free from appendages of any sort. The lower margin is often reflexed near the base. The leaf-cells are arranged in a single layer, except very close to the line of insertion, where they are in two. They are polygonal in outline and do not vary greatly in size in different parts of the leaf. The cell-cavities are separated from one another by thin walls, which become slightly thicker where three cells meet, forming inconspicuous "trigones." The marginal cells are



EXPLANATION OF FIGURES.

1—Two plants, natural size. 2—Male plant, anterior view. 3—Female Plant, anterior view. 4—Part of sterile stem, posterior view, only a portion of the rootlets indicated. 5, 6—Underleaves. 7—Cells from middle of leaf. 8—Transverse section of stem, showing the thin-walled internal cells, and the superficial cells with their thickened walls. 9—Transverse section of leaf-cells. 10—Cells from apex of one of the teeth. 11—Perichætial bracts with connate bracteole. 12—Perichætial bract. 13-15—Paraphyses mixed with the antheridia. Figures 2-15 variously magnified. All the figures are drawn from specimens collected by the writer at Jackson, New Hampshire.

bounded on the outside by somewhat thicker walls and a transverse section of a leaf will show that these thickened walls are continued over the two free surfaces of all the cells.

In addition to the two rows of well-developed leaves, there may sometimes be found a third row of minute, rudimentary leaves. They are situated on the lower surface of the stem, and, from their position are properly known as "underleaves." They should be sought for among the crowded rootlets, and, as they are inconspicuous from their pale color and are also transitory structures, they are rarely to be found except near the apex of the stem. There is typically one of these underleaves developed for each pair of normal leaves; they are very variable in shape and are deeply divided into two slender, ciliated or toothed segments.

Jungermannia barbata is a "dioicous" species, that is, the antheridia and the archegonia are borne on different plants. In connection with these organs we shall find that the leaves become peculiarly modified, giving rise to what are termed "bracts." Those developed in connection with the antheridia are known as "perigonial" bracts, and those in connection with the archegonia, as "perichætial" bracts.

The plants which bear the antheridia are somewhat slenderer than sterile plants, particularly in the parts where the antheridia with their bracts are found. These latter are borne in clusters of five to ten pairs; they do not terminate the growth of the stem, but may be succeeded by ordinary leaves. When dissected off and spread out, the bracts are very like normal leaves, although they occasionally bear one or two slender teeth on the upper margin close to the base. While still attached to the stem, however, they present a very different appearance; they are attached by a line of insertion which becomes almost transverse above and they are at the same time strongly concave, so that each bract encloses a little pouch between itself and the stem. Within this pouch (but attached to the stem), the antheridia are developed in clusters of from two to five; mixed with them, are frequently found minute pointed, leaf-like "paraphyses," which vary greatly in shape and which apparently aid the bracts in retaining moisture for the antheridia and in thus preventing their shriveling away. The underleaves corresponding to the bracts are similar to those found on sterile stems.

Unlike the antheridia, the archegonia are borne in terminal clusters and stop the further elongation of the stem which bears them. After they have been formed, and particularly if fertilization has taken place in one of them, there is developed from just below a peculiar, hollow, cylindrical organ, known as the "perianth." This extends far beyond the archegonia, becomes contracted and plicate in the upper part, and, at its mouth, is finely and irregularly toothed. The perichætial bracts are found below the perianth and pass gradually into normal leaves so that it is impossible to draw a rigid line of distinction between them. The bracts of the pair next below the perianth are the most characteristic; they are almost transversely inserted and are appressed to the base of the perianth. Like ordinary leaves, they are normally four-toothed, but the teeth and their sinuses tend to be more acute than is usual and their margins frequently bear one or more slender teeth or appendages. The underleaf corresponding to these bracts is much larger than the normal underleaves and is known as a "bracteole." It is irregularly divided into sharp segments and is either free or connate with one of the bracts at the very base. It was said above that the formation of archegonia terminated the growth of the stem; very often, however, one or two branches, known as "innovations," are developed from its lower surface close to the perianth. These lengthen, apparently forming an elongation of the stem, and, if they grow luxuriantly, sometimes force the perianth to one side, so that it appears almost as a lateral organ.

Most of the points brought forward in the above description are illustrated by the accompanying figures. Specimens for study will gladly be sent by the writer to any one who may desire them.

Yale University.

PARTHENOGENESIS IN COMMON PLANTS.

By Edward L. Greene, LL. D.

LAST spring, while occupied in an attempt to segregate certain species of Cudweed which had been confused under the name of *Antennaria plantaginifolia*, I seemed to discover certain very curious facts in relation to the propagation of the species. All the individuals of all the species of *Antennaria* appear to be strictly unisexual; and, after having explored acre after acre of the true Plantain-leaved Cudweed, and in different localities, in search of male plants, I gave up without having found a single specimen of that sex. Yet, the untold thousands of female plants yield seed in abundance, and the species is propagated freely by such seed.

In my earliest segregate from that species, *A. neglecta*, the male plants, though common enough, are in flower about two weeks in advance of the females, even when growing together; so that, by the time the stigmas are developed in the female plants, the flowers of the male are dry and dead, their pollen gone. Moreover, in both these common plants, one fails to find a trace of pollen from any source, or of any kind, upon the flowers of the females at any time. In publishing last year my *A. neglecta* (Pitt iii. 173), I made brief mention of these facts. But, apprehending the possibility of oversight of some kind on my own part, I have wished to direct others to these plants, in hope that this matter of parthenogenesis in such highly organized species may be either confirmed or disproven.

Again, some of our most common violets have a long season of apetalous flowering, after their vernal period of petaliferous bloom is past. Such later and apetalous flowers are usually spoken of as cleistogene, by which it is meant that their ovaries are fecundated by pollen while yet in the bud. Now in many such violet species the later and apetalous flowers are actually subterranean; and in carefully examining these at every stage in their development, I have failed to find a single pollen grain. They do not even develop anthers, but only certain very feeble and utterly sterile rudiments of such an organ; yet from these evidently unisexual and wholly subterranean flowers most of the seed, if not all of it, by which these species are propagated, is produced.

Physiological research is something quite apart from my own preferred lines of botanical investigation; and I am not very strongly set for the defense of this proposition that these and perhaps other common plants are parthenogenetic. If other readers of the PLANT WORLD and students of plant life, would, during the season now opening, examine some of the plants I have mentioned, in reference to these particulars, I should be glad to know the results, be these what they may.

REPORT UPON THE PROGRESS OF THE BOTANICAL SURVEY OF NEBRASKA.*

By Charles E. Bessey.

THE Botanical Survey of Nebraska in charge of the Botanical Seminar of the University of Nebraska, has been formally under way for somewhat more than five years. Before that time it had been carried on by the members of the Seminar in an informal way, for seven or eight years under the general direction of the head of the Department of Botany of the University. Since the assumption of the work by the Seminar much field work has been done in many parts of the state by members, and others who have been induced to act as correspondents. The results of this field work have been worked up by the resident active members into available form for consultation and study. A herbarium of about 10,000 specimens is one of these results. This is much more than a mere aggregation of mounted specimens, much labor having been expended upon it to make it show the distribution of species. For this purpose outline county maps of the state are attached to the species sheets, and on these each station is shown by a red stamp. For many species this has been carried out quite completely, the map being well dotted over with station stamps, while for others the work has just begun. When this has been done for all the species, the Survey Herbarium will possess unusual value from the phytogeographical standpoint.

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* 1. Read before Section G of the American Association for the Advancement of Science. August 10, 1897.

The formal publications of the survey began in 1892 with No. 1 of its series of "Reports," this being a preliminary announcement. No. 2 followed in 1893, containing reports upon two somewhat extended explorations, and a list of additional species discovered in the state. A year later No. 3 appeared, including many additions to the list of species, a bibliography of the flora of Nebraska, a list of botanical expeditions made in the state, and a revision of the nomenclature of the Nebraska Polypetalæ. The fourth report appeared in 1896, and included many new species of fungi and an extended list of other additions, amounting to fifty-five new species; and over three hundred others. These several lists of additions brought the total number of species for the state to very nearly thirty-two hundred.

In 1893, the "Flora of Nebraska" was projected, and in August of 1894, parts 1 and 2 appeared, including descriptions of all the known Protophyta and Phycophyta of the state, and in addition the holophytic Carpophyta. These parts are illustrated by thirty-six full-page plates, including over three hundred figures. In December, 1895, another part of the Flora (21) appeared, devoted to the Rosales, and involving a treatment similar to that accorded to the lower plants.

During the two years past much attention has been given to the arrangement of the facts thus far observed into such order as would serve as a basis of the phytogeography of the state. From time to time papers have been prepared and read in the public meetings of the Seminar. The following are some of the titles: "The Plant-formation as an Element," "Mycological Statistics of Nebraska," "The Periodicity of Flowering," "Herbaceous Vegetation-Forms," "Ecological and Distributional Statistics of Nebraska Grasses," "The Habitat-groups of the Prairies." These phytogeographical studies have been brought together in a volume entitled the "Phytogeography of Nebraska," now in course of publication by two members of the Seminar.

In the phytogeographical work already done it has been possible to trace the boundaries of the botanical regions and districts with a good deal of accuracy. Thus there is a narrow belt of the Wooded-Bluff and Meadow-land Region along the eastern and northeastern border of the state; next to this is the Prairie Region, and beyond this the Sand Hill Region, while near the western border there is a belt of the Foot-Hill Region. Each of these is easily separable into districts, the first into the Missouri and the Ponca districts; the second into the Elkhorn, the Platte and the Blue river districts. The Sand Hill Region is separable into the Niobrara, the Loup and the Republican districts, and the Foot-hill Region into the Pine-Ridge and the Lodge-Pole districts. A map has been constructed on which these have been outlined with much attention to the boundary details, and another map giving the physical features of these regions and districts is almost ready for publication.

The matter for another part of the "Flora," dealing with the "Fungi Imperfecti," is well under way, and it is hoped that it may be sent to press before many months. The fifth report which is now in preparation will include some new species, and from one hundred and fifty to one hundred and sixty-five additions, bringing the total number of species for the state to about thirty-four hundred.

The University of Nebraska.

SMILAX GLAUCA IN WINTER.

By C. F. Saunders.

THE genus Smilax is represented in that part of Southeastern Pennsylvania which is contiguous to Philadelphia, by the three species *S. rotundifolia* (the Common Cat-brier), *S. herbacea* (the Carrion-flower), and *S. glauca* (the Glaucous Greenbriar). The last named species is abundant in the picturesque hills which line the Schuylkill river near Philadelphia. There it is found from a couple of feet high in old fields and dry, open woodlands, up to twenty feet or so in length climbing upon shrubs and small trees or straggling over old stone fences. By the superficial observer it may be and sometimes is mistaken for the Cat-brier, which it resembles in leaf and general habit, but a careful examination will reveal distinct differences. These differences are very apparent in the late fall and in winter, at which seasons the Cat-brier in this latitude is quite denuded of foliage, while on the vines of *S. glauca* many of the leaves persist —beautifully crimsoned and mottled by the cold, and well distinguished by the powdery covering of their under surfaces.

The stem of *S. glauca* is a very characteristic part of the plant. It is perceptibly slenderer, more flexuous and much less terribly armed with thorns than the Cat-brier, though in this respect the larger vines of *S. glauca* are by no means to be despised. While the Cat-brier's stem is a dull green and rather harsh to the touch, that of *S. glauca* is of exquisite smoothness and pleasant to feel, and more or less covered with the delicate bloom which gives to the plant its specific name. The color of the stem in these winter days is generally a limpid purple or wine-color, blotched and speckled with green. Seen under the lens, it reminds one of the gorgeous back of some tropical snake. The same exquisite coloring will be found also on the peduncles and pedicels of the black fruit which is still clinging to some of the vines in mid-winter. Even the prickles are beautiful in hue, being a clear chestnut-brown, quite distinct from the dead green or yellow-white of the Cat-brier's thorns.

Taken altogether, *S glauca* is by no means the least among the many interesting sights in the fields and woodlands of winter, and any one who loves the plants, will be well repaid by a trip at this season to examine it in the field.

Philadelphia.

PROTECTIVE STIPULES.

By Charles A White.

THERE have been many discussions among botanists as to the true nature of stipules, among the latest and best of which are those by Dr. A. A. Tyler and Prof. Lester F. Ward. It is not my purpose to join in those discussions, but only to point out the important protective use which two well known plants, Rheum and Smilax, respectively make of their stipules.

One of the first of the perennial plants of the kitchen garden to make its appearance above ground in the spring is Rheum (the Pie-plant). While other plants are hesitating in fear of frost, Rheum, if she has, during the previous seasons, established a vigorous main stem, boldly thrusts up her night-capped head to reconnoitre. Perceiving no immediate danger she rises a little further, throws off her head-wrap and begins to display that cluster of flower buds which springs from the axil of her first leaf, and also to slowly evolve the leaf itself.

This leaf, although the first to appear, is the lower-most one of those which are to adorn the coming stem when it shall have reached its full height; and the head-wrap which she has just cast aside was a perfectly closed membranous sac, made of the stipules of that leaf by being neatly and completely joined together at their edges. The ordinary bursting of this membranous stipule-sac is caused by the starting growth of the parts of the plant which lie tightly folded within it, but it is also liable to become broken up by the destructive action of spring frosts.

It is the habit of all the members of the family to which Rheum belongs to provide their leaf stalks with ample membranous stipules, but in most cases at least they are of little or no apparent use to the plant. An evident use of those organs to Rheum, however, is protection against spring frosts, and although they are themselves thus destroyed, the parts which they cover are fully saved by their intervention if the frost is light.

If Rheum should encounter a light frost just after she has raised her head above ground she would not be thereby injured or disturbed in any part of her season's growth, because the force of the frost would be expended on the stipule-sac, which has no further use. But if the frost at that, or a subsequent time should be so severe as to injure or destroy the first cluster of flower buds as well as the stipule-sac which covered it, another is ready to take its place as soon as the temperature moderates. That is, the next cluster, springing from the axil of the second leaf, lies unharmed beneath the injured one, covered there by the stipule-sac of that leaf. Furthermore, there is such a sac for every coming leaf and flower cluster.

Thus cluster succeeds beneath cluster until the whole series of leaves of the coming stem, their stipule-sacs and the axilary flower clusters of each, are all numbered. Even if half of those flower clusters should be successively destroyed by frost the remainder are severally protected and preserved until the advent of more favorable weather. These alone are amply sufficient to mature an abundant progeny for the plant; and none of the preceding disasters will have inflicted real injury.

Smilax does not need the kind of protection that Rheum requires, but having a very slender stem, although a woody one, it needs protective support like that required by climbing plants. The tendrils of climbing annual plants are sometimes modifications of leaves or leaflets, but it matters little to such plants what part is so modified because not only the leaves but the whole plant is destroyed at the end of the season. Woody plants, however, which are supported by tendrils need their permanent aid; and such tendrils must therefore not be deciduous, as leaves are.

The tendrils of woody plants need to remain on duty after the leaves and fruit have fallen off, and to extend their service through all the seasons of several years. This service is naturally and fully accomplished in the case of those plants whose tendrils are modified branches because they are necessarily permanent. There are, however, a few woody climbing plants whose tendrils are a modification of parts that in other plants are annually deciduous; but these parts become permanent by virtue, or as a correlative part, of that modification. In the cases referred to the tendrils are modified stipules, and the plants bearing them are severals pecies of Smilax, all of which are known by the common name of Greenbrier.

At the time of their falling, deciduous leaves of woody plants usually separate easily from the stem by a clearly defined incisure, leaving only a scar upon the plant to mark the place of the former attachment; but although the leaves of Smilax are deciduous, their separation from the stem takes place quite differently. Two tendril-stipules arise from the basal portion of the petiole of the newly forming Smilax leaf and, like other tendrils, soon seize upon adjacent objects. If, when autumn comes, this leaf should separate from the stem in the same manner as do other deciduous leaves, the stipule-tendrils would go with it, and the plant then be without support.

To provide for continuous support by its tendrils the leaves of Smilax are shed in a peculiar manner. The basal part of the petiole, including that portion from which the stipule-tendrils arise, clings as tightly and permanently to the stem from which it grew as if it were really a part of it. In autumn, when other plants shed their leaves, the petiole of smilax weakens, not at its base, as is the case with other leaves, but at a point just beyond the stipule-tendrils. The petiole breaks off there and the blade is cast by the chilly winds among the multitude of other fallen leaves, while the tendrils remain as permanently on duty as if they were modified branches of the plant. They never loosen their hold upon the stem, and cease to perform their office of tendrils only in consequence of decay, after years of service.

These two cases of modification of stipules are remarkable, not only for their obviously protective uses, but for the extreme difference in the purpose of each. They are moreover remarkable because stipules are not a constant part of leaf-bearing plants. They are entirely wanting in a large proportion of such plants, and are abortive or inconspicuous in many others. Indeed, when stipules are present they are rarely of any apparent service to the plant upon which they grow, except as accessory foliage.

Smithsonian Institution.

The herbarium, letters, manuscripts, drawings, etc., belonging to the late M. S. Bebb, the well known authority on Salix, have become the property of the Field Columbian Museum of Chicago.

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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FOR the plate in the last number illustrating Mrs. Britton's article on Ophioglossum, we are indebted to the *Bulletin of the Torrey Botanical Club.*

⁂

WITH this number Dr. Alexander W. Evans begins an introduction to the study of the Hepaticæ. The principal types of the group will be taken up successively in the same thorough manner. This will be an indispensable aid to those who would begin the study of this somewhat difficult but exceedingly interesting group.

⁂

MR. Charles Louis Pollard has been obliged to discontinue his series of articles on the "Families of Flowering Plants" with the end of the Monocotyledons. It is his intention to publish the complete series in book form, with proper illustrations, at an early day. It will be a valuable presentation of the characters and peculiarities of the flowering plants, and in popular language.

⁂

THE Biological Society of Washington, at its meeting on February 26, held a symposium on the "Teaching of Biology." The speakers included distinguished naturalists of the so-called old school, and investigators and educators of the new or younger school. The discussion took quite a wide range, but the concensus of opinion appeared to be that the modern method of teaching biology in schools, colleges and universities tended to extinguish the true natural history spirit. The value of histology, embryology, morphology, cytology, etc., was not underestimated, but it was regretted that it seemed to make so few *botanists* and *zoölogists*. Several of the papers will be printed in this journal.

⁂

UNDER the title of "School Gardens," Mr. H. L. Clapp has an interesting and suggestive article in the February number of the *Popular Science Monthly.* It describes the garden, first undertaken in 1891, in connection with one of the Boston grammar schools and the results obtained. The piece of ground was only 48 by 72 feet in the back yard, yet they now have growing over 150 species of wild flowers and ferns. The children take all the care of the plants and show the greatest enthusiasm in this study of nature at first hand. The garden also affords abundant material for class-room work. According to Mr. Clapp, school gardens are a prominent feature of public school instruction in Europe. Thus Austria has nearly 8,000 school gardens in which practical instruction is given in rearing trees, vegetables, and fruits. In France there are 28,000 schools in which gardening is taught, each school having a garden attached. In one of the provinces of Southern Russia 227 schools out of a total of 504 have school gardens. It is hoped that these school gardens may be ultimately introduced as extensively in this country, and to this end it is urged upon teachers to read this article.

.... NOTES AND NEWS.....

Number 3 of the "Bulletin of the New York Botanical Garden" was issued on February 15. It contains, besides certain financial statements, a list of some 2,700 species of plants now growing in the garden, illustrations of the proposed museum building and horticultural houses and a map of Bronx Park. Ground was formally broken for the museum building on December 31st.

Apropos of Prof. Halsted's notes in the February issue of the PLANT WORLD upon the "Growth of Stems After Being Cut," I noticed last spring in the case of cut stems of the Swamp Pink (*Helonias bullata*) the same sort of elongation that he refers to. Unfortunately I made no record of the exact amount of growth, but it was so marked in a vase of the flowering stems as to force itself upon the attention. —*C. F. Saunders, Philadelphia.*

In the first week of January many buds of the giant Christmas Rose (*Helleborus altifolius*), some unclosed and others partially expanded, were frozen and remained ice-bound until after the commencement of March. On the departure of the frost the limp stems recovered their consistency and the flowers opened, none the worse for their lengthened period of torpor, furnishing a gathering of perfect blooms on March 7. The Chrysanthemum blooms, imported in solid blocks of ice from the antipodes and subsequently exhibited in London, also prove that flower-petals are not injured by being hard-frozen, although alternations of frost and sunshine quickly mar their beauty.—*S. W. F., in The Garden.*

The Winter number of the *Fern Bulletin* marks a new departure in the history of this very useful and interesting little magazine. A Moss Department has been added, under the editorship of Dr. A. J. Grout, and the aim is to help any one interested in the mosses to get some knowledge of them without excessive labor or expense. The editor will also try to identify specimens if accompanied by notes and return postage. Besides the outfit for the study of mosses, Dr. Grout gives a short, simple description of the Haircap mosses with illustration, and offers to supply specimens of four of the species for ten cents in stamps. We cordially commend this department to all lovers of the mosses, and hope it will be as cordially welcomed as the fern notes have been in the past.—*E. G. B.*

Dr. O. F. Cook, Mr. Charles Louis Pollard and Mr. Guy W. Collins, of the U. S. National Museum, and Prof. E. L. Morris, of the Western High School, D. C., left on March 5th for a six weeks' botanical collecting trip among the Florida Keys. They go first to Key West, where they will secure a small schooner and will then visit the various Keys, and expect to reach Miami about April 5th. Dr. Cook is commissioned to make a collection of algæ, which is to be sent to the Omaha Exposition. The other members of the party will make a general collection, including herbarium and various economic material, and are also commissioned to obtain museum material for the New York Botanical Garden. As this is a favorable season in which to visit Southern Florida, it is expected that the party will bring back valuable collections.—*F. H. K.*

On a jardiniere stand by my desk is a genuine limestone cliff, with crag and buttress, the former rising some eighteen or twenty inches above the foundation, with a six-inch wing sloping off in the rear to the brim of the platter on which it rests. Nature has roughly chiseled two sides of the "peak," and here and there is a suggestion of quartz. Although destitute of all save a lichen and a bit of dry moss when put in place, a luxuriant growth is over it all at the present date (February 16). A choice trio holds the fort. The Walking-Leaf (*Camptosorus*) spreads itself luxuriantly in ribbon designs of green, enhanced by nature's daintest lace-work, *Asplenium Ruta-muraria*, tucked in here and there; a fine foil to both in cut and color of frond is the pretty *Asplenium Trichomanes*, which often attends the other two. A great clump of this fern rests against the curving flank; the more delicate *side issues*, however, are quite as attractive. A stretch of *Asplenium platyneuron* extends along the opposite side and outlines its straight, narrow fertile fronds against the perpendicular face of the crag. *Pellæa atropurpurea* is also here; likewise that little cosmopolitan, *Cystopteris fragilis.* Given a natural environment of rock and soil and the Pellæa proves itself an ideal house-fern. Vernation is much more rapid in-doors than out, and the "doing up" or "undoing" of the fronds extremely unique. The first season of this experiment the platter was frequently turned to give all sides a chance at the stronger light; but revolving cliffs are not in the natural order of things, and warped and twisted stipes quickly resulted. The Pellæa was most susceptible of all; but, undisturbed, the fronds grew straight and handsome. This year the Wall-Rue is particularly fine; old fronds have withered and a dozen new ones can be counted on a single plant. It is really marvelous that these two ferns, subject to the bleakest kind of climatic exposure, should grow so well out of season, not ten feet from a coal fire and subject to direct rays of the sun from a southern bay-window, although some three feet from the glass.—*G. A. Woolson, Pittsford Mills, Vt.*

. . . BOOK REVIEWS . . .

First Lessons With Plants. Being an abridgement of "Lessons With Plants: Suggestions for Seeing and Interpreting Some of the Common Forms of Vegetation." By L. H. Bailey; 8 vo., pp. 117. The MacMillan Co., 40c.

Whatever Professor Bailey writes is certain to be good, and the present little work is an admirable proof of this fact. These simple lessons, he says in the preface, are designed to awaken an interest in plants and in nature rather than to teach botany. They are suggestions to the teacher who desires to introduce nature-study into the school, and as such they must prove of the greatest value. The first lesson is on twigs and buds, and suggestions are made regarding the study of buds and branches, leaf and flower buds, the opening of buds of various types and the struggle for light and air that is constantly going on in the tree-trop. One thing leads on naturally to another, and the child becomes an investigator without knowing it, soon learning to compare and interpret the buds, their arrangement and products of various trees and shrubs. The apple is made frequent use of, and thus the rudiments of horticulture are founded. In similar manner leaves and flowers are taken up and the important types described or, rather, worked out. The final chapters mention briefly the propogation and habits of plants and directions for collecting and preserving plants properly. The illustrations are profuse, all new and freshly drawn, and add much to the completeness of the book. Altogether it is a work that should be in the hands of all teachers in the grades for which it is intended. The type and printing are exceptionally good.—*F. H. K.*

THE PLANT WORLD

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THE ELEPHANT TREE.

By F. H. Knowlton.

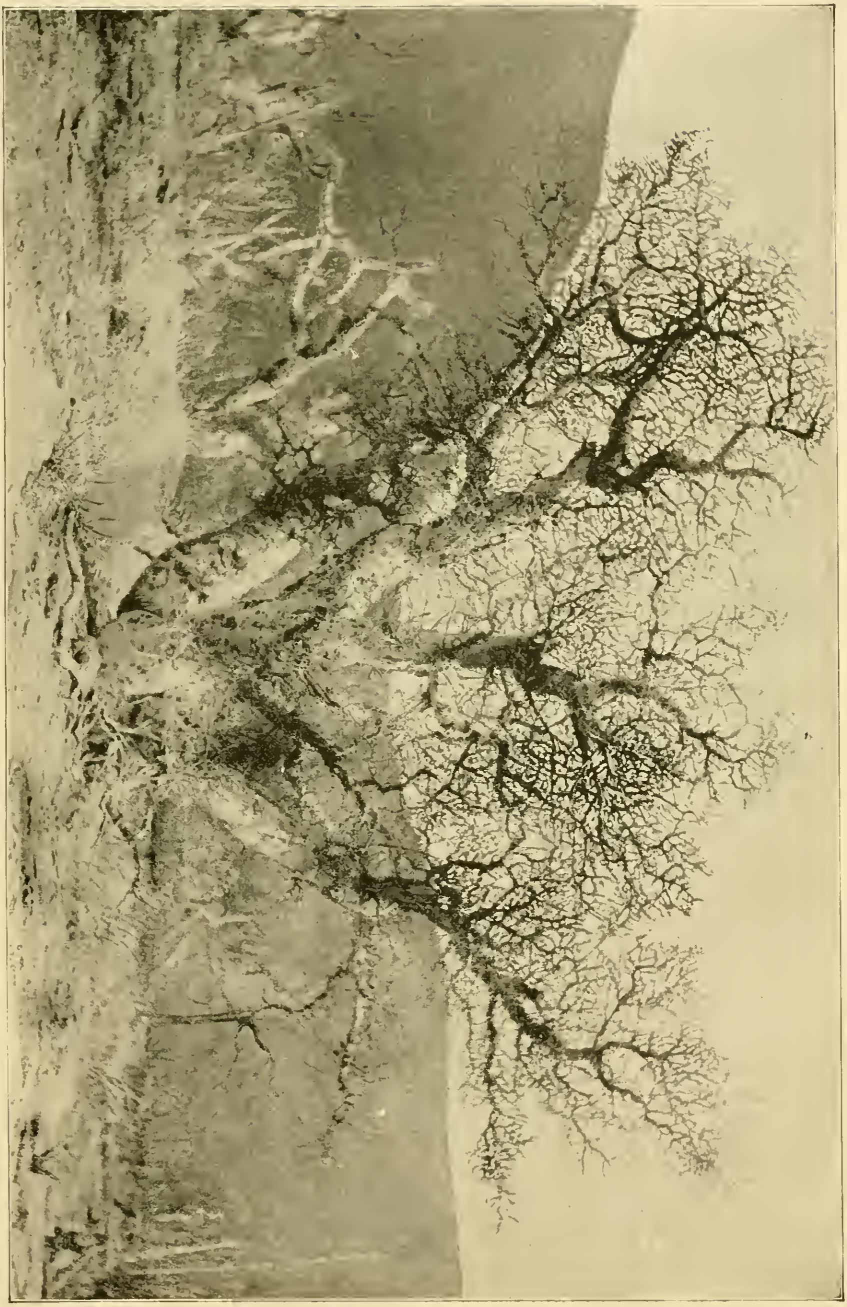
THE Peninsula of Lower California is essentially a desert, a condition brought about by a very slight annual rain-fall and an almost total absence of permanent water from its sandy and rocky wastes. The heat is intense and prolonged, and as a result of these conditions the vegetation is scant and of such form as will best conserve the precious moisture. The cacti of various forms, and spiny, nearly leafless shrubs are the dominant elements, and the effects produced are said to be strange and weird in the extreme.

Of all the curious floral forms growing in this area, perhaps none is more remarkable in many respects than the so-called Elephant Tree (*Veatchia discolor*). This is a huge, distorted shrub or low tree, from ten to twenty-five feet in height, with a short trunk sometimes two feet in diameter, and low, tortuous, widely spreading branches. Following is the description written by Mr. Hinds, the botanist of H. M. S. *Sulphur*, who discovered the tree about 1840: "I have also seen some attempts at trees; imagine what the bones and muscles of a giant would be distorted into three feet; such looked these trees. They twisted and twirled, but could not assume the erect position. Their diameters were far from inconsiderable." Dr. John A. Veatch, in whose honor the genus is named, and who observed and collected it about 1859 on Cedros Island, has the following complete account of it: "The Elephant Tree is one of the curiosities of Cedros Island. It derives its name from the elephantine proportions of its sturdy, heavy looking trunk and branches. The main trunk of a full grown tree will probably average two feet in diameter, the height being but little more, and often less than the diameter. In some favorable situations I observed a few that reached an elevation of six feet; this was, however, an unusual occurrence. The trunk divides into several ponderous branches that shoot off horizontally, and are bent and contracted into grotesque resemblances of the flexed limbs of a corpulent human being. These huge branches often terminate suddenly in a few short twigs, covered with a profusion of red flowers, reminding one of the proboscis of an elephant holding a nosegay. The resemblance is heightened by the peculiar brown, skin-like epidermis that forms the outer bark, which splits and peels off annually, accommodating the increase of growth. This epidermis, when removed, exposes the smooth, greenish-colored surface of the spongy inner bark, which is from one to two inches in thickness. When this bark is cut through a milky juice exudes, which soon hardens into a compact mass of gum and resin. The quantity furnished from a single cut is considerable. Whether the exuded matter be of any value I have had no means of testing as yet; but as the tree belongs to a natural order that furnishes our most valuable and expensive gum-resinous products, it is not improbable that it may prove worthy of attention in that regard. The wood is light and porous and soon decays, and is not likely to be of any economical utility.

"The branches of the larger trees often shoot out to a horizontal distance of twenty feet from the trunk, thus covering an area of forty feet in diameter. Smaller subordinate limbs spring upward from the upper side of the large boughs, and in this way give a neat oval appearance to the outline of the tree. When loaded with its bright red flowers the effect is strikingly beautiful, particularly when hundreds of the trees stand near each other, intertwining their huge boughs, and forbidding ingress to the mysterious space they cover and protect. The leaves are minute, and fall off before the blooms are fairly developed. The young tree looks a good deal like a huge radish protruding from the ground, with but a single root and a few twig-like branches expanding from the top.

"On the mountain sides, from a little above the seashore to an elevation of fifteen hundred feet, these trees grow scatteringly, singly and in small clumps; but in the narrow vales of the ravines they sometimes form groves of several acres in extent, presenting the impenetrable and compact form above described. From June till August seems to be their blooming season."

The Elephant Tree belongs to the Cashew family (*Anacardiaceæ*) and is closely allied to the genus Rhus (Sumach)—so closely in fact that it was for many years supposed to belong to it. It differs from Rhus in its valvate sepals, accrescent petals, thin-walled fruit, and above all in its habit. The leaves are one to three inches long, and composed of 1–7 pairs of entire or lobed leaflets only one or two lines in length. The flowers are borne in immense compound panicles, and when in full bloom completely cover the, at that time, leafless tree.



THE ELEPHANT TREE (*Veatchia discolor*).

The bark of this curious tree is said to be very rich in tannin and has been exported for this purpose, although it is hardly probable to assume much importance in this respect.

The photograph from which our plate of the Elephant Tree was made was taken by Mr. George P. Merrill on July 25th, 1892, at a place called Tule Arroyo, about fifteen miles from the gulf coast. Its use in the present connection is by the courtesy of the U. S. National Museum.

THE STINGING NETTLES.

By V. K. Chesnut, U. S. Department of Agriculture.

THE Stinging Nettle (*Urtica dioica* L.) is a stout, weedy perennial, two to four feet high, with square stems, thin, heart-shaped leaves, three to five inches long, and inconspicuous, green axillary clusters of flowers and fruits. It is a native of Europe, but has been extensively naturalized in the United States. Among the other common names by which it is well known on this continent are the following, viz: Nettle, Great Nettle, Great Stinging Nettle, Common Nettle, Common Stinging Nettle. The plant grows abundantly in waste places about dwellings throughout New England, southwestward to Ohio and West Virginia; less commonly southward to Tennessee and South Carolina; somewhat rarely in Kansas and Nebraska, but abundantly in the mountains of Colorado and Wyoming. It is found in small quantity from Texas to California.

The peculiar irritant property of this plant has been ascribed by various chemists to formic acid, a glucoside, an alkaloid, and to a non-volatile ferment. Formic acid alone does not produce the characteristic effect. The alkaloid isolated by Oddi and Lomonaco (Rif. Med., Apr., 1892,) is a crystalline compound and acts very powerfully on the vaso-motor system. Whatever the nature of the principle may be, it is certain that it exists mostly if not entirely in the glandular hairs which, interspersed with two other kinds of hairs, sparsely cover the whole surface of the plant except in the very early stages of its growth. When brought into contact with the skin these glands inject their poison into it, and an irritation is thus set up which is more or less painful according to the susceptibility of the person and the number of hairs introduced into the skin. The itching is accompanied by a more or less extended swelling or thickening of the skin. This begins immediately and generally passes away in the course of a few hours, but may last for a whole day.

Cattle eat the plant only when very young or when dried with hay. In these conditions it is nearly, if not quite harmless, for in the young plants the glandular hairs have not fully developed, and in the dry ones the poison has become more or less dissipated or decomposed.

The chemical nature of the poison being unknown, it is impossible to give a rational method of counteracting its effects. Experience has, however, shown that an application of ammonia water gives much relief. The swelling may be abated by keeping the skin cool, either with water or ice or by pouring alcohol upon it.

Of the seven other species of stinging nettles found in the United States, the two following are perhaps the most worthy of note:

SLENDER NETTLE (*Urtica gracilis* Ait.)

A taller (2 to 7 feet), but more slender, and perhaps less stinging species than the preceding, with smoother and narrower leaves and smaller flower clusters. It has nearly the same range and is probably more abundant, but since it abounds chiefly in places more remote from human habitations, it is less important. Thousands of acres of reclaimed swamp land in Michigan and Wisconsin are made nearly worthless by its dense growth, horses refusing to pass through it to cultivate the soil.

SMALL NETTLE. DWARF NETTLE (*Urtica urens* L.).

This is an introduced annual, six to eighteen inches high, with small, elliptic, coarsely-toothed leaves, and short clusters of green flowers. The stem and leaves are sparingly provided with stings. It is a common weed in cultivated soils in California and the Gulf States, and is introduced to some extent throughout the Atlantic States and in Kansas and Missouri.

The Wood-Nettle (*Urticastrum divaricatum* (L.), Kuntze; *Laportea Canadensis* Gaud.), is very closely allied to the true nettles, and is likewise provided with stinging, glandular hairs. It is a low, stout perennial, two to four feet high, with large, alternate, ovate, long-stemmed leaves three to seven inches long. The inconspicuous flowers are borne near the end of long, slender flower-stalks. The plant grows in moist rich woods, from Maine to Minnesota, and southward to Florida and Kansas.

"Some Troublesome Weeds of the Mustard Family" is the title of a contribution by Prof. L. H. Pammel in the "Bulletin of the Iowa Experiment Station" (No. 34, pp. 656–686). It contains descriptions of the more noxious species, their distribution in this country and the most effective means for their eradication. The paper is illustrated by fifteen full-page plates.

A NEW COMPASS PLANT.

By Lester F. Ward.

THERE are few better known weeds on our great plains than *Lotus Americanus* (Nutt.) Bisch., which has until recently gone by the name of *Hosackia Purshiana* Benth.

I had in my camp during the past season's geological campaign in southwestern Kansas two students from Southwest Kansas College, Messrs. Mark and Paul White, whose home is in Reno county, and who are studying botany as part of their college course. They informed me that there was a plant very abundant in Reno county, which always grew flat, the branches projecting in exactly the opposite direction from the stem, presenting a peculiar appearance like lattice-work, and that moreover these branches always extended north and south, so that they could depend upon the plant in getting their direction. I asked them by all means, if they saw this plant, to bring me a specimen, and in a few days they succeeded in doing so. It proved to be the *Lotus Americanus*, and I found that they had not exaggerated their statements. I had already seen and collected the plant, but had failed, as I suppose all others have failed before, to observe this phenomenon. I immediately hunted it up in the vicinity and was able to examine thousands of specimens under diverse conditions. The opposite or distichous character of the branches is a universal fact under whatever conditions the plant may grow, but the orientation varies according to circumstances. Cases could be found in which some of the plants stood east and west, or at any other angle, but these were usually where many were growing close together shading one another, or where other plants, or rocks, or trees, were present to disturb the situation. This, however, is nothing more than what we find to be true of all compass plants. They must be more or less isolated and situated so that the sun can exert its normal influence upon them during the entire day, otherwise they will not be exact indices of direction.

Wherever the *Lotus Americanus* was thus situated the branches were developed on the north and south sides of the stem only. These branches are alternate and not opposite in the strictly botanical sense of the term, but being arranged on the opposite side of the stem only, they may be characterized as distichous.

We have then in this plant another example of a true compass plant, but involving an entirely different principle from that of the *Silphium laciniatum* L., *Lactuca scariola* L., etc., in which it is the leaves and not the branches that are effected.

THE TEACHING OF BIOLOGY IN THE PUBLIC SCHOOLS.

By Barton Warren Evermann, Ph. D.,

Ichthyologist of the U. S. Fish Commission.

AS I take it, the principal reasons for the study of Biology in the schools are:

1—That the student may receive that peculiar mental training and acquire that peculiar mental habit which can come only from a study of living organisms.

2—That he may gain, as fully as may be, an understanding of how each of the vast array of animal and plant forms about him is related each to the others, and to the physical environments which surround them, and how they have come to be what they are.

There are many other excellent reasons for the study of nature, sufficient to demand for it a prominent place in the work of the schools, even if those I have given did not obtain, but they cannot be considered in this brief paper.

Now, what is that peculiar training or mental habit which is supposed to result from a proper study of animals and plants?

It is that mental attitude which refuses to take things on faith or to accept things on authority; which demands the production of the evidence, and which insists upon a personal examination of the evidence, that judgments may be formed and conclusions drawn first hand.

The training should be such as will enable one to distinguish fact from fancy, reality from fraud and make-believe; to know truth, as well as falsehood, when he sees it; to know what he knows and to realize, and promptly admit it, when he does not know.

This power, it seems to me, is the most important thing the schools can give the child. And to give it in the highest degree requires that the child be brought in contact not only with the living forms of the animal and plant world, but with the inorganic world as well, and the various forces or forms of energy whose phenomena surround him on every hand. All these are perhaps equally good as material for teaching the necessity for examining evidence first hand, but organic objects, living and active, and the phenomena connected with their life and growth, possess peculiar advantages not shared by other objects.

Now, as to the second reason: Throughout life each person is surrounded, whether he realizes it or not, by multitudes of animals and plants. Unless he be actually blind, or practically so, as a result of the methods in the schools, his mind is constantly questioning these things, for they press upon him from every side; he cannot get away from them. What is this animal or this plant? What are its habits? How does it live? Upon what does it feed, and what feeds upon it? Why is it found in certain places and not in others? What are its relation to soil, shade, and moisture? Why are the plants which grow here large and thrifty, while those over there are small and stunted? Why can I not find two exactly alike? In what does this animal resemble others that I have seen, how does it differ from them, and what do these likenesses and differences mean? In short, *what are these animals and plants, and how have they come to be what they are?*

These are but a few of the multitude of questions that will be constantly coming to one throughout life, and the training which every child receives in the schools should be such as will enable him to take an active and intelligent interest in these questions; for this means not only right thinking, but right living, and he will thus add not only to his own happiness, but to that of others as well by being able to lead them somewhat into a realization of the law and beauty which pervade nature.

Whatever be the method to follow in teaching biology in the public schools, every one will admit that it should not be such as will kill off the enthusiasm of the pupil. The child enters the school knowing a good deal already about animals and plants. Every normally constituted child is full of the spirit of the naturalist, but I regret to say that the whole tendency of the methods in most of our public schools is to stamp out completely this inquiring spirit; and this in spite of more or less blind, irrational attempts at "Nature Study" in many of the schools.

The method should increase rather than diminish the child's interest in the animate world. The student should leave school full of interest in animals and plants and with the desire and power to continue their study intelligently.

This, it seems to me, is an absolute essential. The naturalist spirit of the student must not be killed off. Happiness, of one's self and others, is a legitimate object to seek in life. To increase one's lines along which happiness may be secured is one of the most worthy aims of education. He who has the spirit of the naturalist has a great advantage in this regard, for he need never be lonesome, nor will he ever have any time to kill. This is the beauty and great advantage that natural history studies have—that one may have constantly about him his material for investigation, a splendidly equipped laboratory, so long as he lives.

As a result of several years devoted to teaching biology, I have had ample opportunity to judge of the net product of the various methods of biological teaching. I have tried the various different methods and have thoughtfully considered the results, not only of my own teaching, but of many other teachers as well.

Very interesting and important facts were learned through close personal and official relations with several hundred young men and women who were fitting themselves to teach in the public schools. These students had come chiefly from the country schools and high schools, though many were college graduates. Many of them had studied zoology or botany, or both, in the high schools and colleges, and " Nature Study " in regular grists had been ground out to many others in the grades in the town and city schools. Still others were fresh from the woods and fields, where they had studied nature without being handicapped by books and public school teachers. Those who had studied biology in the schools had been taught by various methods. Interest in my own work led me to acquaint myself as fully as possible with the methods of instruction employed in the different schools from which my students came. This was done through visits to the schools, conferences with the teachers, and a study of their printed courses of study. The *results* of the methods were learned through an intimate acquaintance with the students who came from the various schools.

The methods in vogue in the different schools were various,—not to say variegated. In some the teacher followed more or less religiously some text-book such as Holder, Tenney, Orton, or Steele's Fourteen Weeks' Course; in others, a little " analyzing " of plants constituted the course; in others, the work was limited to such dissections and studies as are provided for in such laboratory guides as Colton, Boyer and Brooks in Zoology, and Arthur, Barnes and Coulter in Botany; while in yet others, morphological studies were supplemented by a systematic study of species in one or more groups, and of the local fauna and flora.

It goes without saying that the teachers following the first two methods have no conception of the purpose of the function of biological study in the high school. That of the third group is but little, if any, better.

The graduates from the schools where biology was taught by the first three methods rarely, if ever, elected any biological work when they came to the State Normal School, never manifested any interest in biological subjects, and not one of several hundred that I have known has become a teacher of biology, so far as I have ever learned.

On the other hand, many of those who had learned more or less systematic zoology or botany and something of animal and plant anatomy, had become imbued with the natural history spirit and were anxious to continue work along those lines and to become teachers of biology in high schools and colleges. Many who came with no knowledge of morphology as such, none of histology and embryology, and none of microscopic technique, but who knew a few species and knew how to determine others, were nevertheless full of the spirit of the naturalist, anxious to continue their natural history studies, and to include work more truly morphological. These, together with the students fresh from the fields, were the students who constituted the backbone of the classes in biology, who were active, useful members in the students' natural history club. They were the ones who were always ready for a tramp into the woods and fields, who saw things when they got there, and who could talk or ask questions intelligently about what they saw. And they are the ones who have become teachers of biology themselves, many of them in high schools, others in state normals and colleges.

It is not contended for a moment that the purpose of biological teaching in the high schools or even in the colleges is, primarily, to make naturalists. But it certainly should not kill off every embryo naturalist who ventures into the classes in biology. It should be such as will imbue him with the true scientific spirit and acquaint him with the methods of science. He will then know the value of personal investigation and be able to judge the value of the testimony of others.

Many things in this world must be taken on faith, but the faith need not be unreasoning and blind. Whole animals and plants, alive and active, are the objects which will continue to appeal to us after we leave the schools. Questions of adaptation to environment, of geographic distribution, variation, and the like, are the ones which will continue to interest most intelligent people. The ability to consider these questions necessarily requires a knowledge of species. The student of biology who does not know species, it seems to me, must be greatly handicapped.

Some persons who know no systematic zoology or botany seem to think that the systematist needs to know nothing about the anatomy of the specimens with which he works,—that he knows no morphology, or at least makes no use of morphological facts. The ludicrous blunders such people make when, in an unguarded moment, they attempt to deal with species, show how erroneous their conceptions are.

When nature study in the grades and biological teaching in the high schools are carried on in the proper way, our students, when they become men and women, will not become, as so many now are, a prey to every fraud that comes along. From nature they will learn the value of truth and the certainty of the punishment of those who trifle with truth.

THE EXTENT OF DODDER PARASITISM.

By E. J. Hill.

IN the Plant World for January (Vol. I., page 52), Mr. Willard N. Clute mentions the omnivorous parasitism of one of our common dodders (*Cuscuta Gronovii*), the statement being added that it would be interesting to know how many kinds of herbs and shrubs it attacks. In 1891 and 1892 I made some special studies upon the dodders with this end in view, carefully identifying all specimens taken in the field, and carried home for study, on which the parasites were found. The identifications could in nearly all cases be made specific.

The species of dodder in the vicinity of Chicago are *C Gronovii*, *C. inflexa*, *C. tenuiflora*, *C. arvensis*, *C. chlorocarpa* and *C. glomerata*. Those with the widest range of host plants were *C. Gronovii*, *arvensis* and *tenuiflora*, though *chlorocarpa* comes well up in the number. From the groups of plants attacked by the first three at least, the conclusion was reached that their hosts might be universal in character, and that the more restricted number, in the case of some others, was due rather to the less abundance of the species than to any lack of ability to use certain plants for hosts. The case of *C. glomerata* was different. It was limited to species of *Helianthus* and *Solidago*. Its mode of coiling and its rope-like character, when in fruit, need an upright stem, with leaves few or remote for its proper development, and the straight columnar stems of *Helianthus* and *Solidago*, whose lower leaves usually die and fall early, and which branch but little till near the top, are well adapted to this. The dodder also grows in open, sunny places where many of the sunflowers and golden-rods abound. So far as I have seen it confines itself to a single stem, twining directly upward as far as it grows. Other dodders shoot off on branches and bridge open spaces among their hosts and thus make a tangle of stems. These habits, rather than any appetency of nourishment in the host of *C. glomerata* may account for its restriction, a mechanical rather than a physiological necessity, though the two have doubtless coöperated in modifying the species by interaction.

A list of plants on which *C. Gronovii* has been found is given, some additions from other localities and other years of observation being added. A similar list could be made for *C. arvensis* and *C. tenuiflora*. Many hosts were doubtless overlooked, though the areas covered were carefully searched. The nomenclature used is that of Gray's Manual as noted at the time of collection. Specific names of trees and large shrubs pertain to young stages of growth. The list is as follows:

Parasitic on itself, on *Ribes floridum*, *Eupatorium ageratoides*, *Cinna arundinacea*, *Asprella Hystrix*, *Circæa Lutetiana*, *Solidago Canadensis*, *Aspidium Thelypteris*, *Onoclea sensibilis*, *Erechtites hieracifolia*, *Solidago serotina*, *Rubus strigosus*, *Lactuca Canadensis*, *Steironema ciliatum*, *Dioscorea villosa*, *Cnicus muticus*, *Populus tremuloides*, *Eupatorium purpureum*, *E. perfoliatum*, *Clematis Virginiana*, *Cornus paniculata*, *Mentha Canadensis*, *Vitis cordifolia*, *Rhus typhina*, *R. Toxicodendron*, *Muhlenbergia sp.*, *Amphicarpæa monoica*, *Agrimonia Eupatoria*, *Polygonum Virginianum*, *Xanthoxylum Americanum*, *Tiedemannia rigida*, *Ampelopsis quinquefolia*, *Stachys aspera*, *Prunus serotina*, *Sambucus Canadensis*, *Impatiens pallida*, *Cephalanthus occidentalis*, *Apocynum cannabinum*, *Aster puniceus*, *Polyganum convolvulus*, *Quercus macrocarpa*, *Ulmus fulva*, *Salix cordata*, *Lycopus sinuatus*, *Bœhmeria cylindrica*, *Hypericum maculatum*, *Fraxinus pubescens*, *Iris versicolor*, *Salix discolor*, *Leersia Virginica*, *Aster Tradescanti*, *Scutellaria lateriflora*, *Aralia racemosa*, *Rosa Carolina*, *Viburnum Lentago*, *Cornus sericea*, *Prenanthes alba*, *Bidens frondosa*, *Rubus villosus*, *Aster paniculatus* (?), *Helianthus strumosus*, *Pedicularis lanceolata*, *Corylus Americana*, *Lobelia syphalitica*, *Andropogon sp.*, *Helianthus grosse-serratus*, *Polygonum hydropiper*, *Muhlenbergia Mexicana*, *Desmodium paniculatum*, *D. Dillenii*, *Aster diffusus*, *A. umbellatus*, *Diervilla trifida*, *Salix rostrata*, *Physocarpus obtusifolius*, *Celastrus scandens*, *Cryptotænia Canadensis*, *Saururus cernuus*, *Solanum Dulcamara*, *Fraxinus viridis*, *Polygonum lapathifolium*, *Calamagrostis Canadensis*, *Hibiscus Moscheutos*, *Decodon verticillatus*, making 84 species.

Chicago, Ill.

About Philadelphia on February 22d of this year, the Winter Aconite (*Eranthis hyemalis*) was opening its pretty yellow flowers, the first really conspicuous blossom of the year. On the same day, in the low land along the Delaware just south of the city, the Silver Maples (*Acer dasycarpum*) were sparingly in bloom on the southern sides of the trees. In a sunny spot on the banks of the Schuylkill, on March 6th, one plant of Spring Beauty (*Claytonia Virginica*) had ventured a shy blossom into the winds of March, while a couple of buds showed pink, apparently waiting the result of the pioneer effort of their sister. Hard by, the crevices of the rocks sheltered from the north and warmed by the afternoon sun, twinkled with the tiny white blossoms of the Whitlow Grass (*Draba verna*). This last small harbinger of the spring was discovered in bloom last year in the same place as early as February 21st.—*C. F. Saunders*, *Philadelphia*, *Pa.*

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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WE hope soon to begin a series of articles on collecting and preserving plants and the making of a herbarium.

⁂

THE study of botany may of course be begun at any season of the year, for during even the bleakest winter weather many interesting things may be observed about plants, but it is nevertheless true that spring seems the most appropriate season for the commencement of this study. The snows of winter are giving place to milder days and the seemingly endless procession of floral riches is being inaugurated.

⁂

THE December number of this journal contained a brief summary of the report of the Forest Commission of the National Academy of Sciences on the United States Forest Reserves, and plans for their administration. Based on these recommendations, President Cleveland, on February 22, 1897, issued a proclamation establishing thirteen forest reservations, containing an aggregate area of 21,379,840 acres. These reservations are located in South Dakota, Montana, Wyoming, Idaho, Washington, Utah and California, and were planned to include and preserve the head-waters of many important streams. The establishment of these forest reserves was violently opposed by the local population, who had come to look upon the timber belonging to the government as personal property. This influence was so powerful that Congress was induced to suspend the proclamation until March 1, 1898, providing in the meantime for an extensive survey and mapping of the areas in dispute. The Sundry Civil Bill, as recently reported, contains an amendment providing for the indefinite suspension of the Cleveland proclamation, thus in effect completely destroying the good work begun after so many years of wasteful extravagance.

It is possible that certain of the areas are larger than absolutely demanded for a satisfactory conservation of the water supply, and can be judiciously reduced or readjusted. These matters could be safely left to a commission, which should include representatives of the locally interested parties, as well as skilled foresters and hydrographers. It is earnestly hoped they will not be entirely abandoned. Forests are a priceless treasure which an hundred years will not restore when they are once destroyed. Let us begin in time and not wait until they are gone before adopting means for their protection. Then it will be too late.

.... NOTES AND NEWS.....

Dr. Charles R. Barnes has been appointed Professor of Plant Physiology in the University of Chicago.

The Field Columbian Museum, of Chicago, has accumulated during two years of active work an herbarium of over 50,000 mounted and classified sheets.

The genus Carex is the subject of a very interestingly and beautifully illustrated article by Mr. Charles F. Saunders in the April number of *Godey's Magazine.*

Mr A. J. Grout reports, in the February number of the *American Naturalist*, the finding of adventitious buds on the leaves of the Sundew, as described by Mr. Jas. A. Graves in the November number of the PLANT WORLD. It is curious that the production of new plants from buds on the leaves of old ones should have escaped attention so long.

Prof. D. P. Penhallow, of McGill University, has just published in the "Transactions of the Royal Society of Canada" (second series, Vol III.), a valuable *Review of Canadian Botany from 1800 to 1895.* It contains accounts of the botanists, herbaria, botanical gardens and botanical societies, and closes with a bibliography of works and papers devoted to Canadian botany.

Dr. A. J. Grout has compiled a list of the mosses of Vermont from the collections of such enthusiastic students as Frost, Pringle, Blanchard, Faxon and others. The state is rich in rare and interesting mosses, and this list includes 75 genera and about 250 species. Dr. Grout has taken pains to see most of the specimens, and has adapted his keys from those of Dr. Barnes and the Muscologia Gallica to agree with the bifurcating system in use by Dixon, which is so easy to follow. They work out very nicely and will be useful to students of the local flora as well as to others in neighboring states, who should be tempted to emulate Dr. Grout's good example.—*E. G. B.*

A fund is being raised for a monument in memory of Baron Sir Ferdinand von Mueller, the distinguished Australian botanist, who died October 10th, 1896. It is to be erected over his grave at South Yarra, Victoria.

There is a Fan Palm found fossil near the mouth of the Yellowstone river, in Montana, that had leaves from 8 to 10 feet in diameter. It is known as *Sabal Campbellii* and is probably the largest fossil palm yet found.

Dr. J. C. Arthur has an interesting article in the December number of the *Annals of Botany* on the movements of protoplasm in the hyphæ of many of our common moulds, a phenomenon not fully recognized before. He finds the conditions under which these movements take place to be somewhat complicated, but when everything is favorable the protoplasm "has a surging precipitate flow, very striking to any observer, even to one accustomed to the diversity of microscopic life, and reminds one of the flow of blood in the capillaries of a frog's web."

While near Lake Trafford, in southern Florida, during January and February of this year, I noticed that a large number of Cypress trees (*Taxodium distichum*) had not yet shed their leaves. Perhaps the larger number had dropped their leaves, yet growing in the same situations and similar in size and appearance, were those which retained the foliage as bright and green as in spring. Can any one suggest a probable cause for this?—*Robert Ridgway, Smithsonian Institution, Washington, D. C.*

There is almost no more interesting feature in the study of the lower races of mankind than their contact with the natural surroundings. Development and elaboration of the arts and alike of the mind are involved in the utilization of the plants, animals and minerals of the environment. Ethnobotany is a word which marks the entrance of botany into the field of ethnological researches; it may be defined as the study of plants in their relations to human culture. The study has already furnished clues or confirmation of many of the problems which confront the ethnologist. Collectors of plants can do much to advance ethnobotany by securing also the common names and uses of plants, not alone from Indians, but from the folk. Mr. F. V. Coville's "Directions for collecting specimens and information illustrating the Aboriginal uses of plants," published by the U. S. National Museum, is an admirable guide, which should be in the hands of every one interested in forwarding the science of ethnobotany.—*Walter Hough, U. S. National Museum, Washington, D. C.*

LIBRARY

On June 25, 1897, I collected the Yellow-fruited Sedge (*Carex xanthocarpa* Bicknell) here. Mr. E. P. Bicknell tells me this is the westernmost record so far as he knows. The range given in the books is "Massachusetts to New York and Ohio."—*Virginius H. Chase, Wady Petra, Ill.*

. . . BOOK REVIEWS . . .

CATALOGUE OF NORTH AMERICAN PLANTS NORTH OF MEXICO, EXCLUSIVE OF THE LOWER CRYPTOGAMS. By A. A. Heller; paper, small 8 vo., pp. 160. Published by the author, March 10, 1898; price 60c.

The publication, as complete as it is possible to make it, of a catalogue of the North American flora, is a welcome book. The last attempt of similar scope was Patterson's "Check-List," the latest edition of which was printed in January, 1892. That list included 12,794 species and varieties; the present catalogue embraces 14,534 forms, the great increase being the measure of activity in systematic botany during the six years between the two lists. The families are arranged in the Engler and Prantl sequence and the nomenclature is in accord with the rules adopted by the Botanical Club of the A. A. A. S. The book is well printed on strong paper, and the remarkably low price, which is really the actual cost of publication, should place it in the hands of all working botanists.—*F. H. K.*

A LABORATORY MANUAL OF PRACTICAL BOTANY. By Charles H. Clark; pp. 271. New York: American Book Company.

Good laboratory manuals of botany are already numerous, yet the little work before us possesses some features that recommend it. Logically, the study of botany should begin with the slowest and simplest forms and pass on to the relatively more and more complex, but in the case of students who have had little or no previous training it is often difficult to do this successfully. These minute forms of plant-life are so wholly unfamiliar that it is impossible to correlate them with the ordinary familiar forms. To obviate this difficulty the author has a chapter of preliminary studies which begin with the higher or flowering plants and pass hastily in review the whole vegetable kingdom. Then follows the main portion of the book, in which the various types, beginning with the simplest, are studied with considerable thoroughness. The student is required to work out the life-histories as fully as possible for himself, and in the hands of a competent teacher the book will prove very useful. The illustrations are in the main copied from standard works; a few are original and not always satisfactory. The paper and printing are all that could be desired in a book of this kind.—*F. H. K.*

THE PLANT WORLD

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BLUE RIDGE BLOSSOMS.

By Albert Gardner Robinson.

I AM not a skilled botanist. I am only a flower-lover. But I have spent a "world of happy days" on the hillsides and in the valleys among the mountains of western North Carolina, in search of those

> "Flowers worthy of Paradise, which not nice art,
> In beds and curious knots, but Nature bron
> Poured forth profuse on hill and dale and plain."

It is probable that some of my readers are not without experience in that beautiful and interesting section. It is equally probable that there are many who have not been so fortunate.

Such a list of the flora of any section as it is possible to give in a magazine article, must, of necessity, be incomplete—suggestive rather than exhaustive. This obtains with marked force when it relates to such a district as that which forms the basis for this paper, for two reasons. One reason is the space which would be required for such a list—the other, that nothing short of a thorough and systematic search covering several years, and involving the time and service of a considerable number of searchers, would make an exhaustive list possible. A great portion of the more than twelve thousand square miles of mountain region in western North Carolina is wild and rough. Comparatively little of it has been thoroughly explored, botanically. A wide variety of conditions is presented, and the flora of the section embraces plants which are almost semi-tropical, such as the *Yucca filamentosa*, and others which are semi-alpine, such as the *Loiseleuria procumbens*. There are flowers which are said to grow nowhere else in the world, such as one or two of the Orchids which grow in the vicinity of Roan mountain. Some, which are rare or uncommon elsewhere, are abundant there. I have gathered the *Lilium Grayi*, with its pendant bells of "deep reddish orange," as it is described in Gray's Manual, ranging, as I have found it, to a deep Indian red, until my hands would hold no more. The Manual gives this lily, "flowers, 1 or 2." I have picked many of them with three, and not a few with four, blossoms, though never with more than four. The *Galax aphylla* grows, literally, by the acre. Gray gives the *Pogonia verticillata* as "rather rare, especially eastward." Hamilton Gibson, in one of his delightful papers, refers to it as "quite rare." I can go to one or two of my woodland gardens here, during their season, and find the queer little things, like small, green-bodied spiders with long, brown legs, by hundreds, and almost by thousands.

The section has been covered in a general way, but it is more than probable that, hidden away in this wilderness, there are still a goodly number of plants which are not yet included in the catalogue. The season is a long one. There is no month in the year in which I have not found some wild-flower in blossom, though that is due to one or two exceptionally mild seasons during December and January.

The season opens with the Trailing Arbutus, which grows in a profusion, and attains a development such as I have not seen equalled, east or west. The earliest specimen which I have found was picked in 1897, on February 24. The season really opens from March 12–18. At that time, and only then, I am ready to say that the flowers have come. I have seen them all killed by snow and frost after that date, but that is exceptional. From that time until nearly, if not quite the first of December, there is no time when one may not have some wild-flowers on the table. About the middle of March, then, I begin my flower-hunting rambles.

Many of the early-comers are insignificant, and others are but little valued because they are so abundant. Immediately upon the heels of the Arbutus there come the Wood-Anemones, the Bluets, the Dog-tooth Violets, the Blood-root, a half-dozen or more of the early violets, and numbers of other blossoms. Early in April I begin my search in certain localities for some of my special favorites, early-comers, of the Orchid family—the Spectabilis, and the Yellow Cypripedium. I get them both in abundance. The little Spectabilis, ranging in its color from deep-purple, through pink-purple and white-purple, to a few which I have found of a pure white, loves to hide away along the side of old fallen logs. They are often a bit puzzling to find, and that adds not a little to the interest of a search for them. Gray says that the Yellow Lady's-slipper, both the *C. pubescens* and the *C. parviflorum*, grows in "bogs and low woods." My gardens of them are in the rich coves on the mountain sides. I have picked many a hundred of them at an altitude of over four thousand feet. Few flowers make a more beautiful bouquet than those same yellow slippers

—if one has enough of them. The bright emerald color of the deeply-veined leaves makes a most effective setting for their golden cups. During the whole of May and June I revel in an ever-increasing flood of color and fragrance. The height of the floral tide is reached early in July. Then begins the ebb, and though there are still flowers and flowers, they lessen both in scope of variety and of interest.

My list of the members of the Orchid family, found in the section now numbers twenty-three, though it includes one or two which I have been unable to identify. I have *Liparis liliifolia*, *Aplectrum hiemale*, *Spiranthes præcox and S. gracilis*, *Goodyeara pubescens*, and a little one which I believe to be an Arethusa, though not given in my manual. I have *Calopogon pulchellus*, *Pogonia ophioglossoides*, *P. pendula*, *P. divaricata*, *P. verticillata*, *Orchis spectabilis*, *Habenaria tridentata*, *H. cristata*, *H. ciliaris*, which I find in endless profusion, and a quaint white-hooded affair with a very long spur, evidently Habenaria, though I cannot make it fit anything in my book. I have *H. peramœna*, *Cypripedium parviflorum*, *C. pubescens*, *C. spectabile*, and *C. acaule*. This by no means exhausts the possibilities of the section regarding this family, but, as a botanical greenhouse, I am quite disposed to feel rather proud of my success in finding so many of my particular favorites.

The region is a very good one for Liliaceæ. My list includes, among others, the *Yucca filamentosa*, *Polygonatum biflorum*, *P. giganteum*, *Smilacina racemosa*, *Maianthemum*, *Disporum*, *Clintonia umbellata*, *Uvularia perfoliata*, *U. grandiflora*, *Oakesia sessilifolia*, *Lilium superbum*, *L. Grayi*, *Medeola*, *Trillium* of five varieties, *Chamælirium*, *Tofieldia pubens*, *Melanthium Virginicum*, and *Amianthium*.

I have made rather a specialty of both of these groups because they interest me. I like the rich coloring of Calopogon, and am interested by its curious structure. I know few odors which can compare with the delicate fragrance of *Pogonia ophioglossoides*. I like to bunch the Clintonia with sprays of Maiden-hair fern. I enjoy the strikingly artistic effect of a cluster of *Lilium Grayi*. The rival queens of the lily family are easily the Yucca and the *L. superbum*. I have seen the *superbum* eight feet in height and crowned with thirty or more of the golden-red bells. I found *Habenaria ciliaris* growing so abundantly in one or two of my wild gardens that I could, and did, gather it by the armful. Gray gives it as growing in "wet, sandy places." I found few varieties of what I call "bouquet flowers" growing under such a wide range of conditions as this yellow-fringed Orchis. I found it in abundance in damp bottom-land, and I found it scattered profusely over the hillsides among thick undergrowth, and in the open woods. I picked it on the top of Whitesides mountain at an elevation of five thousand feet above sea level.

[*To be concluded.*]

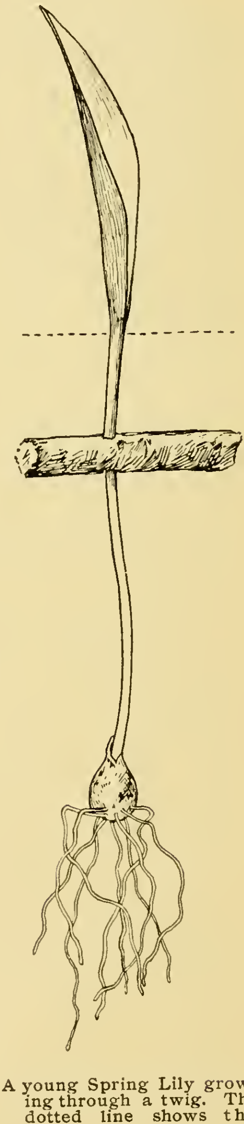
A VEGETABLE AWL.

By Charles E. Bessey.

YESTERDAY a friend handed me a "Spring Lily" (*Erythronium albidum*), which illustrates what a plant can do when necessary to overcome obstacles. The leaf which started up from the small bulb late in the winter, after growing nearly four centimeters, encountered a serious obstacle to its upward growth in the form of a twig five millimeters thick, which, while somewhat rotten, was still quite well preserved. This twig was held down by twelve or thirteen millimeters of earth, so that it remained firm when the point of the rolled leaf began to push against it. It must have been a severe struggle which took place under the ground when the young leaf steadily pushed its way toward the light. The leaf must reach the light or perish, and, as the diver who meets with an obstruction to his ascent *must* overcome it or drown in the depths, so this leaf must overcome the obstructing twig which bars its way to the sunlight. How this was done is shown in the accompanying sketch. Not being able to lift the twig or push it out of the way, it pushed through it, as an awl is pushed through a piece of wood.

An examination of the specimen shows that the apex of the leaf is armed with a mass of harder cells which protect the softer tissues below the apex, just as the iron shoe of an alpenstock protects the softer wood of the shaft. In the leaf this hard point bore the pressure from the swelling cells below, and it was finally thrust into and through the twig, the hole being exactly like that made by an awl when thrust into wood without twisting. As may be seen, the leaf and the plant as a whole are none the worse for this exploit, the blade being perfect in outline and of full size, while the long petiole shows but its usual graceful curves.

The University of Nebraska, April 19, 1898.



A young Spring Lily growing through a twig. The dotted line shows the ground line. (Natural size)

STUDIES AMONG OUR COMMON HEPATICÆ.

By Alexander W. Evans.

II. Lophocolea heterophylla (Schrad.) Dumort.

THE first type which we studied, *Jungermannia barbata*, was essentially a plant of the mountains and reached the plains only as a rarity; our second type, *Lophocolea heterophylla*, is much more at home in the lowlands and is only occasionally found at higher altitudes. Like the *Jungermannia* it is a common, species, and is also found in Europe and Siberia. It is, however, so variable and grows in so many different kinds of places that it takes some little time to become familiar with its many forms. Along the coast, it seems to prefer sandy banks, where it often forms flat tufts of considerable extent, the plants growing close together without any regularity in their arrangement. If the banks are partially shaded, the hepatic is bright green, but it becomes yellowish-green if exposed to the sun. In such localities the plants are usually fertile, and the fertile stems, which are at first closely appressed to the sub-stratum, curve upward near the perianths so as to bring the latter into a vertical position. If the perianths are at all numerous, they form a conspicuous feature of the tufts and often aid us in the recognition of the species. The *Lophocolea* is also common on rotten wood in shaded places, particularly on old stumps, where it is sometimes pale or even whitish-green in color. It may also be found, although more rarely, on shaded earth, at the base of trees and even on shaded rocks. Around the tufts it is usually possible to find prostrate stems, which give a better idea of the ordinary vegetative characters of the plant than the fertile stems.

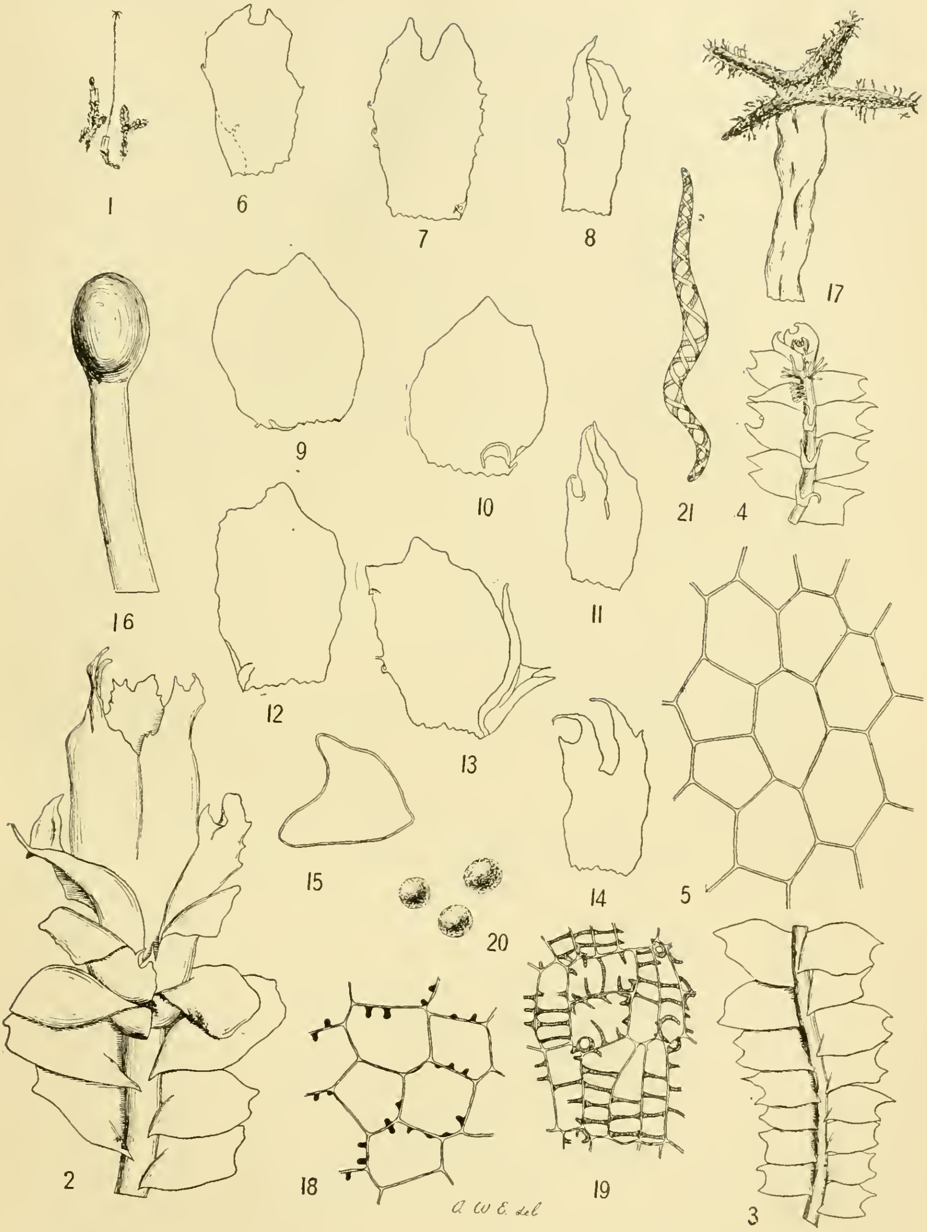
Although smaller than *Jungermannia barbata*, our *Lophocolea* is by no means a small species, the individual plants often reaching a length of $1^{\text{cm.}}$ and measuring with the leaves 1–$1.5^{\text{mm.}}$ in width. The stems are delicate in texture and are built up of cells which show little differentiation; all of them have thin and colorless walls, and the green cells of the superficial layer pass by gradual transitions into the larger colorless cells of the interior. The pale rootlets are normally borne on the lower surface of the under leaves very close to the base, and they may be limited to such situations; frequently, however, they are developed on the lower surface of the stem as well. The stems do not branch copiously, but occasionally fork or give off a lateral branch or two.

The leaves here again are very obliquely inserted and are succubous; on robust fertile stems they are imbricated, sometimes closely so, while on feebly developed stems they are much more loosely arranged. They are ovate in outline, but are remarkably variable in regard to their lobes or teeth. On young or delicate stems and branches, they are divided into two sharp lobes, separated by a blunt sinus, which extends about one-third of the distance from the apex toward the base. On robust stems the lobes are usually less pronounced and blunt; sometimes, indeed, the leaves are simply emarginate and sometimes, the sinus disappearing altogether, they become truncate or obtuse at the apex. It is moreover common to find all these variations on a single stem; but, except for the lobes, the leaf-margins are quite entire. The leaf-cells do not vary greatly in size in different parts of a leaf; they are polygonal in outline and their thin walls are not thickened at the angles.

Underleaves are always present in this species and may be found on the lower surface of the stem, one for each pair of leaves. It is, however, sometimes difficult to see them on account of the rootlets. They are small but distinct structures, and are divided almost to the base into two lanceolate segments, which are either entire or bear a small tooth-like protuberance on the outer margin at about the middle.

In its inflorescence, *Lophocolea heterophylla* is "monoicous," that is the antheridia and archegonia are borne on the same plant; it is furthermore of interest in the fact that these organs are developed on the same stem, the archegonia being terminal and the perigonial bracts being situated immediately beneath the perichætial. If a stem bearing a perianth is examined, the two or three pairs of perigonial bracts may be at once recognized by the peculiar way in which they embrace the stem. When they are dissected off and spread out, it will be found that they are a little larger than the stem-leaves, but are otherwise similar to them in shape and in variability. The underleaves corresponding to these bracts gradually increase in size toward the perianth; they are less deeply cleft than those of the stem and their marginal teeth sometimes attain a considerable size. The perichætial bracts, which are often reduced to a single pair, are longer but narrower than the others, and are usually distinctly bilobed, the lobes being variable and separated now by a broad, shallow sinus, now by a narrow one. The bracteoles are quite free from the bracts, and are similar in shape and size to the uppermost perigonial underleaf. The bracts and bracteoles often show on their margins a few delicate and minute teeth, and the bracts sometimes bear close to the base on the upper side one or more almost detached segments, which are very variable in shape. There is, however, nothing answering to the paraphyses of *Jungermannia barbata*.

The perianth of our *Lophocolea* is a very typical structure and shows clearly the way in which this peculiar organ is built up. In



EXPLANATION OF FIGURES.

1—Plants, natural size. 2—Fertile stem, anterior view. 3—Sterile stem, anterior view. 4—Sterile stem, posterior view. 5—Cells from middle of leaf. 6, 7—Perichætial bracts. 8—Bracteole. 9, 10—Perigonial bracts. 11—Corresponding underleaf. 12, 13—Perichætial bracts. 14—Bracteole. Figures 6-11 from the same inflorescence, figures 12-14 from another infloresence. 15—Transverse section of perianth. 16—Capsule, still intact, with part of stalk. 17—Capsule, dry, split into its four valves and commencing to shrivel. 18—Cells from capsule-wall, outermost layer. 19—Cells from capsule-wall, innermost layer. 20—Spores. 21—Elater. Figures 2-21 variously magnified.

All the figures are drawn from specimens collected by the writer in the vicinity of New Haven, Connecticut.

the lower part it is circular in section, but above the middle it is triangular, and is therefore in the form of a three-faced prism; if the perianth is pressed backward, the prism is found to lie in such a way that one of its faces is parallel to the ground, while the other two meet in a sharp angle or "keel" above. At the mouth, which is not at all contracted, the perianth is deeply three-lobed, the lobes being continuous with the three faces of the prism. The lobes themselves are more or less distinctly bilobed and are in addition coarsely and irregularly toothed. The perianth is looked upon as an organ formed by the coalescence of modified leaves, just as a gamopetalous corolla is formed by the coalescence of petals. Three such leaves take part in the formation of a perianth, an under leaf and two side-leaves; and the three flat faces of the prismatic perianth of *Lophocolea* correspond with these three leaves, the face parallel to the ground representing the underleaf, and the other two, which meet in the keel above, the side-leaves. This formation, which is so clearly evident in *Lophocolea*, is made obscure in *Jungermannia barbata* from the fact that the three angles have become indistinct and that the mouth of the perianth is contracted and shows no distinct lobes.

Lophocolea heterophylla "fruits" so frequently that we may use it for the study of the most characteristic part of the sporophyte, namely, the "capsule." If we gather a tuft of our plants covered with perianths in early spring and place it in a saucer underneath a tumbler, where it must be kept moist but not wet, we shall probably be able to note the appearance of these interesting structures in the course of a week or two. Out of doors, the capsule is not usually mature until May. It first shows itself at the mouth of the perianth as a glossy, oval body, dark brown or almost black in color. Very soon it is carried high above the perianth by the rapid elongation of its stalk. The latter is extremely delicate in structure and has a white translucent appearance; its growth is brought about by the elongation of its cells and not by the formation of new ones, and it sometimes attains a height of several centimeters in a few hours. After a while or very quickly, if the plants are exposed to a dry air, the wall of the capsule splits longitudinally down to its attachment with the stalk into four equal "valves" and the contents are discharged; soon afterwards, what is left of the capsule with its delicate stalk shrivels up and disappears.

The valves thin out on their edges into a single layer of cells, but in the middle they are two or more cells thick. The cells are characterized by peculiar local thickenings in their walls. In all except those of the innermost layer, the thickenings are in the form of scattered opaque ridges on the partition walls of the cells and appear in surface view as dark irregular projections into the cell-cavities. The cells of the innermost layer are somewhat smaller than the others and tend to be elongated in the long direction of the valves, although this tendency is not everywhere apparent. Their thickenings are more conspicuous and affect the walls which line the interior of the capsule rather than the partition-walls. The thickenings are in the form of narrow, brownish bands which extend the whole or a part of the distance from side to side and often give the cells a ladder-like appearance.

The contents of the capsule which are discharged when it splits open, are made up of the asexual reproductive bodies or "spores," and peculiar sterile cells, known as "elaters." The spores are small, spherical structures, somewhat variable in size and light-brown in color. Each spore consists of a single cell bounded by a distinct wall, which is covered on the outside with very minute and inconspicuous tubercles. The elaters are long, transparent, thin-walled cells, which taper toward each end, without being sharply pointed; lining the wall on the inside are two brown spiral bands of thickening, which, by their elasticity, aid in scattering the spores. The elaters are dead cells and, as they dry up, the thin wall between the turns of the spirals shrivels away and often becomes quite indistinguishable. It is to be noted that the spores and elaters fill the *entire* space enclosed by the capsule-wall.

The above description of the capsule and its contents applies, in its essentials, to most of the leafy hepaticæ. Certain slight deviations will be pointed out as we meet with them in our studies.

Yale University.

In the vicinity of Lake Flirt, in southern Florida, I recently observed a, to me, curious phenomenon regarding the little Gray Polypody (*Polypodium incanum* or *polypodioides*), which at this place, as in other parts of Florida, covers the large, spreading branches of the Live Oaks. At the time of my visit (March) there had been a long continued drought which had dried and shriveled the fronds until they were as brown and dead looking as possible. One day there was a brief shower, hardly lasting ten minutes, and another one during the night. The next morning the fronds of the Polypody had revived and spread out as bright, and green, and fresh as ever. This power of rejuvenation has earned for the plant the local name of Resurrection plant.—*Robert Ridgway, Smithsonian Institution, Washington, D. C.*

A HYBRID MOSS.

By Elizabeth G. Britton.

MR. D. A. BURNETT has been fortunate in re-discovering the same hydrid moss that was first found by Drummond, near St. Louis, Mo., in 1841, and had not been recorded since. In both cases it grew associated with and on the same plants as *Aphanorhegma*, differing from the sporophyte of that species in having the seta longer and exserted and the capsule with a small apical lid, a distinct spore-sac, and a darker bordered rim. The differences, however, are entirely in the fruits, as no distinction has been discovered in the leaves, they being all normal ones of *Aphanorhegma*. Mr. Burnett found his specimens growing on the ground where the ashes of some old ties had made a bare spot near the tracks of the Erie railroad at Bradford, Pennsylvania. They were associated with *Funaria hygrometrica*, *Bryum argenteum*, etc., and were recognized by him as being abnormal. I described and figured Drummond's specimens in the *Bulletin of the Torrey Botanical Club* for February, 1895 (**22**: 65 t. 231), and these of Mr. Burnett's agree in every way, even to the size of the spores, the length of the pedicels, and the immature and often aborted condition of the exserted, hybrid sporophytes. It is most interesting that this should be the case, considering the distance in time and space, and argues for the identity of the parents, but in both cases the father is unknown, and it is to be regretted that a search was not made at this station the following spring in order to learn if any plants of *Physcomitrium turbinatum* made their appearance in the spot where these grew. It does not seem likely that the antheridial plant of *Funaria* could have been the male parent, as that species has long, slender, curved pedicels and the hybrids all have short, stout, rigid, straight pedicels.

It is more probable that the antheridial plants of *Physcomitrium* mature in the autumn, and that fertilization takes place then and during the winter, as the sporophyte of *Physcomitrium turbinatum* always makes its appearance in the early spring.

March 28, 1898.

In the herbarium of the Field Columbian Museum the American genera are placed in manilla covers, the European in green, the African in blue, the Asiatic in red, and the Oceanian in yellow. If a similar color scheme could be adopted in all of our large herbaria it would save much time in consulting them.

COCOA AND SOMETHING OF ITS HISTORY.

ALTHOUGH much has been written about the cultivation, manufacture and uses of Cocoa, together with its advantages as an article of food, the subject is one of so much interest to the community, that information relative to the primary origin of "the most grateful and nourishing of our non-alcoholic drinks" cannot fail to be appreciated.

Our knowledge of cocoa as an article of diet dates from the discovery of the Western world by Columbus, who, we are told, took home with him samples of the article, "which early attached itself to the Spaniards' tastes." History informs us that the Spaniards were the first who tasted chocolate, which was part of their spoil in the conquest of Mexico. Bernardo de Castile, who accompanied Cortez, describing one of Montezuma's banquets, says: "They brought in among the dishes above fifty great jars made of 'Cacao,' with its froth, and drank it," similar jars being served to the guards and attendants, "to the number of 2,000 at least." Gage, an old traveler who visited the tropics, writing in 1630, remarks: "Our English and Hollanders make little use of it when they take a prize at sea, as not knowing the secret virtue and quality of it for the good of the stomach." For many years the cultivation of the cocoa tree was confined to the Spanish, who, in South America and some of the West India islands, carried on the cultivation to a large extent. From their first settlement in Trinidad, we are told that "it seems probable the Spaniards cultivated the tree, and thoroughly understood its value, the prepared article being always much esteemed in the then opulent mother country. The British colonists seem only to have cultivated it when the crops failed, and to have acquired but a limited taste for the article in its prepared state." We may take it for granted that the "prepared state" of cocoa two or three centuries ago was very different to the prepared cocoa of the present day, the appliances for producing the delicious and sustaining preparations only having been introduced during recent years. Cocoa was much esteemed as a beverage in this country during the reign of Charles II., and at that period Dr. Stubbe published a book entitled "The Indian Nectar, or a Discourse Concerning Chocolate, &c.," in which the author gives a history of that article, and many curious notions respecting its "secret virtue," and recommends his readers to buy it of one Mortimer, "an honest, though poor man," who lived in East Smithfield, and sold the best kind at 6s. 8d. per pound, and commoner sorts at about half that price.

The inestimable plant, named by Linnæus, *Theobroma* (the food of gods), is indigenous to tropical America, but acclimatized within the twenty-fifth parallels of latitude. The cocoa tree is an evergreen, which grows to the height of fifteen or twenty feet, with drooping bright green leaves, in shape oblong, eight or nine inches long, three inches broad, and pointed at the ends. The flowers and fruit, which it bears at all seasons of the year, grow off the trunk and thickest parts of the boughs, with stalks only an inch long. Humboldt saw the flower bursting through the earth out of the root, and wondered at the prodigious vital force of this plant. The flowers, which grow in tufts or clusters, are very small, having five yellow petals on a rose-colored calyx. The fruit is five-celled, without valves, from seven to nine and one-half inches in length, and three to four inches in breadth, of an elliptic oval-pointed shape, somewhat like the vegetable marrow, only more elongated and pointed at the end, tough and quite smooth, the color varying according to the season, from bright yellow to red and purple. The rind of the fruit is very thick, and similar to a very hard, tough apple in substance, but quite tasteless; if allowed to ripen, this changes into a shell of a weak nature. The seeds contained in each pod vary in number from twenty to forty, embedded in a soft pinky white, acid pulp. The cocoa tree, while growing in that portion of the earth wherein the heat is greatest, yet requires a sheltered situation for its perfection. It is grown, more or less, in Mexico, Honduras, Guatamala, Nicaragua, and throughout almost the whole of Central America, in Brazil, Peru, Ecuador, New Grenada, Venezuela, Surinam, Demerara, Essequibo, and the West Indian Islands. It has also been grown in Africa, Mauritius, Madagascar, Isle de Bourbon, Australia, and the Philippine Islands.

Stem of Cocoa Tree showing leaves, flowers and fruit.

As soon as collected the nuts are taken from the pod and covered with a layer of sand. A fermentation ensues, which has the effect of developing the aroma, while it takes off the bitterness of the nuts, which are spread out to dry in a drying or curing house. This house consists of a strongly built span or roof, fixed with wheels running on iron rails laid along a stout framework, which supports a platform underneath, and upon which the cocoa beans or nuts are dried. They are brought to this country in bags.—*Condensed from the British Trade Journal.*

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

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THE delay in the issue of the May number was caused by an unfortunate error which necessitated the reprinting of the entire edition.

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WE have received a number of letters recently from readers of the PLANT WORLD, asking further information on various points suggested in its pages. Please let it be known that the editor will be glad to answer any and all reasonable questions that may come up. Send in your queries freely.

⁂

A LARGE measure of the educational value that might, in many places, be derived from public parks and gardens, is lost from the fact that the trees, shrubs and other plants are inadequately labeled. This is particularly true in the District of Columbia. There are, it is said, over five hundred acres within the city limits, devoted to public parks and gardens, and a great number of beautiful exotic, as well as native plants, are grown to perfection. It is the rarest thing to find any of them labeled. Visitors are constantly asking the name of this or that tree or shrub that happens to be in bloom at the time of their visit. If they were properly labeled it would do far more than satisfy mere idle curiosity; it might be the means of laying the foundation of horticultural taste, and it would certainly give a new idea to many of the value of our native trees and shrubs in beautifying the surroundings of our homes.

A proper label should give the common name, when one is in general use, as well as the scientific name, and an indication of the native country. In the case of trees and the larger shrubs grown along drives, the labels should be of sufficient size and distinctiveness to be easily read from a carriage. When grown along foot-walks they might be of smaller size, yet should be so distinct as to be easily legible. In all instances the labels should be made of such material as will resist accidental or ordinarily malicious breakage. The labels in use in the New York Botanical Gardens seem to fill these requirements satisfactorily. They are cast-iron with the letters raised and painted a different color from the ground-work.

.... NOTES AND NEWS.....

The Field Columbian Museum has just issued as number 4 of the botanical series a third contribution to the Costal and Plain Flora of Yucatan by the Curator of Botany, Dr. C. F. Millspaugh.

Carex vulgaris Fries, a characteristic sedge of the Northern Atlantic seaboard, and only rarely found as far south as Pennsylvania, was collected in 1897 in tidal mud along the Delaware river a few miles below Philadelphia. This is believed to be the most southern station from which this species has been reported.—*C. F. Saunders, Philadelphia, Pa.*

Mr. E. O. Wooton describes a handsome new Wild Rose (*Rosa stellata*), from the high mountains of New Mexico, in the March number of the *Bulletin of the Torrey Botanical Club.* It has solitary, deep rose-purple flowers two inches in diameter, and small 3–5 foliolate leaves, the leaflets triangular and hardly one-fourth of an inch in length. It seems worthy of cultivation.

In the summer of 1889 I spent several weeks in New Mexico, in the vicinity of Santa Fé. At Copper City, which is in the Jemez mountains, I noticed the following phenomenon: I visited a copper mine near that place where a low grade ore is reduced by what is called the cementation process, which consists in dissolving the finely powdered ore by a strong solution of hydrochloric acid, and then precipitating the contents in the form of metallic copper by means of iron scraps. The solution is conducted through several large vats until the copper is so far abstracted from it that it is no longer of commercial importance, when it is permitted to flow down the hill-side. Much of the vegetation has of course been killed, but a number of large pines (*Pinus ponderosa scorpulorum*), whose roots and bases had been bathed by this weak copper solution had not yet succumbed. Any cut in the trunks or even higher branches, which permitted the pitch to exude showed it to be of a beautiful emerald hue, bringing out the fact that the copper solution has been taken up to such an extent as to thoroughly impregnate the entire tree.—*F. H. K.*

The common wild Columbine (*Aquilegia Canadensis*), whose habitat is given in the manuals as "rocks," or "rocky woods," is also found in the shaded sands of the New Jersey sea coast. One of its stations is in a sandy wood of Absecon Island on the outskirts of Atlantic City.—*C. F. Saunders, Philadelphia, Pa.*

Mr. Robert Ridgway's note on the fall of leaves in the Bald Cypress (*Taxodium distichum*), suggests a similar occurrence in the case of the Japanese Privet (*Ligusticum japonicum*), at Washington, D. C., where it is commonly planted for hedges. In ordinarily severe winters the leaves of this shrub drop off in January, but last winter a large proportion of the leaves remained on the plant until the new foliage appeared in April. This shrub, therefore, is to be classed as evergreen or deciduous, according to climatic conditions.—*F. V. Coville, U. S. Department of Agriculture, Washington, D. C.*

A good illustration of the differences in habit induced by climatic conditions is seen in the Egg-plant. As grown in Northern gardens it is a tender herbacious plant, which cannot be safely set in the open ground before June 1, and which is killed by the first suggestion of frost in the fall. On the Keys of South Florida, where it is grown to some extent for the New York market, the plant is a robust, shrubby perennial, ten feet in height, and although the younger shoots die down in winter, it puts forth fresh buds from the main stem in spring. The Castor-oil bean (*Ricinus*) is another familiar example of this.—*Charles Louis Pollard, U. S. National Museum, Washington, D. C.*

"For the second time in its history the 'Barnard Annual' contains the portrait of one who died while devoting to the college all the efficient energy of high intellectual attainments and loving enthusiasm. To the excellence of its botanical department more than to any other feature Barnard owes its rapid growth in popularity and prominence, and that excellence was due primarily to Prof. Emily L. Gregory. Those of us who came into close contact with Dr. Gregory in her home or in her laboratory, must still feel the influence of that sweet, sunny nature which made her such a delightful acquaintance and friend. In spite of the many serious duties which she performed so admirably, no one ever more thoroughly enjoyed genuine fun, and Barnard fun was, in her eyes, a little better than any other, just because it was Barnard. We cannot but feel, therefore, that there is a peculiar fitness in presenting her portrait as the frontispiece of a volume confessedly devoted to the 'lighter and brighter side of our college life' and that *The Mortarboard* must win friends for itself, if for no other reason, because it bears her face upon its opening page."—*The Mortarboard.*

I have been impressed this spring with the profusion of flowers produced by *Viola ovata*, the plant known to students of Gray's Manual as *V. sagittata*. The tendency of the plants is to grow in clumps and their numerous blossoms make each clump noticeable from a long distance. Out of curiosity I took up a plant at random, and found that it possessed seven small leaves, and sixteen flowers and buds.—*Willard N. Clute, New York.*

The National Herbarium recently received specimens of a hermaphrodite willow from Mr. C. C. Kingman, of Reading, Mass. The twig presented not only well developed staminate and pistillate catkins, but in several instances combinations of stamens and pistil within the same ament. Cases of this kind are not rare, and have been hitherto recorded, but it would be interesting to observe in how many species the anomaly occurs. These specimens were evidently *Salix Bebbiana* Sargent (*S. rostrata*). Mr. Kingman observes: "The shrub is an old and weather-beaten affair, and has suffered much from the attacks of insects, so that it has but little vitality. It is staminate on the whole, the variation occurring on certain branches, while sometimes a small twig will show both staminate and pistillate catkins or a mixture of the two in the same catkin."—*C. L. Pollard.*

. . . BOOK REVIEWS . . .

LIVING PLANTS AND THEIR PROPERTIES. By J. C. Arthur and D. T. MacDougal; 12mo, pp. 242. New York: Baker & Taylor, $1.25.

It might be supposed from the title of this book that it was a technical treatise on the physiology of plants, but the reader will not find it so. It is a collection of delightfully written essays on certain of the more important and interesting features of living plants in the broadest sense. It is impossible in this connection to attempt an adequate review of the work, but some idea of its scope may be gained from the following partial list of subjects: Distinctions between plants and animals; Special senses of plants; Development of irritability; Wild Lettuce as weed and compass-plant; How cold affects plants; Chlorophyll and growth; Leaves in spring, summer, and autumn; Significance of color, etc. The facts set forth are in all cases the latest results of investigation in the various lines, and the language is simple and strictly non-technical. The idea that scientific investigators are unable to write in popular language is abundantly disproved by the present work. It is a delight to read it, and it should find a wide sale, not only among professional botanists, but especially among plant-lovers. Let us hope that it is the forerunner of others of its kind.—*F. H. K.*

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

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BLUE RIDGE BLOSSOMS.

By Albert Gardner Robinson.

[CONCLUDED.]

IN one little boggy meadow I found four varieties of Habenaria, and made an attempt at photographing them all upon one plate. I had one or two forest gardens where I could gather Amianthium as I used to get cat-o'-nine-tails when I was a boy in New England, and I found it on the side of Graybeard mountain at an altitude of forty-eight hundred feet.

But although these two groups possessed a special interest for me, I was far from ignoring scores of other growths, some of which were abundant, some uncommon, and some rare. Among them were some which delighted me scarcely less than those of my special hobby. I found none of the tall Iris (*I. versicolor*) which was so familiar to me in the north, but there are few more charming blossoms than the delicately fragrant little dwarf Iris. I found both *I. verna* and *I. cristata.* I was always glad to find them. They make a dainty picture with their pale blue and white standing out against their background of dead leaves and wood-grasses. Of Dandelions I found but few. In some places I found *Passiflora incarnata* in almost as rank abundance as I have seen the Dandelion in other places. They grew as rankly as sheep-briar, and in much the same places—in old, worn-out fields, and along the railroad banks. I found also a few vines of the *P. lutea* I noted a point of some interest regarding these two sisters. The larger one faded and died very quickly after being picked, but I brought in a six-foot spray of *P. lutea*, and it not only kept for nearly two weeks, but the buds turned to blossoms, and blossoms turned to seed-pods before it withered. The Galax is, I believe, strictly a mountain growth. It is best known to many through the use of its leaves for decorative purposes. It flowers with dainty pure white blossoms upon a tall stalk, forming a close raceme of from one to six inches in length and a half-inch or so in diameter. They mix well with some other flowers, but the stalks are much too stiff for beauty when used by themselves. With the coming of frost the rich, deep emerald green of the leaves turns to reds and browns, sometimes of solid color, sometimes variegated, and sometimes mottled. I have found them in red, brown, and yellow, beautiful as autumn maple leaves. With the coming of spring they turn again to their rich summer garb of green. *Asclepias tuberosa* was almost as abundant as the butterflies which haunted it. Of the same group I found the *A incarnata*, *A. obtusifolia*, *A. phytolaccoides*, *A variegata*, and *A. quadrifolia*. At elevations of three to four thousand feet I found abundance of rare Acacia. The *Clematis Viorna*, with its leathery head and graceful plume, was in ample evidence. Drosera was not common, but it was there. I found four varieties of Sabbatia. One variety which grew in swampy ground, was evidently either *S. stellaris* or *S. gracilis*, though there was neither salt nor brackish marsh within three hundred miles. It required no searching to find Silver Bell, Fringe-tree or Calycanthus. Mints, Golden-rod, and Compositæ grew in such variety that I made no effort toward definitely placing them. I simply enjoyed them. They took me too far beyond my little knowledge of botany to do more than that. I measured one of the Compositæ, which I took to be the Tall Coreopsis. It stood thirteen feet and six inches in height. For two or three months the valley fields are bordered with a yellow blaze of Golden-rod of many kinds, and other Compositæ in equal profusion and variety.

The season closes in a wealth of Golden-rod and white and purple Asters. The mountain people call the Aster the "frost-flower." The last "bouquet-flower" to come is the closed Gentian (*G. Andrewsii*), which I have found almost, if not quite, as late as the first of December. Then comes that weird and mystic growth—the Mistletoe. Among the mountains I have never seen it upon any other trees than the black gum and a coarse oak. Its flower is wholly insignificant, but its little berry, so like a pearl, is as much a gem as many a flower. In one locality I found one or two holly trees bearing a yellow berry.

But no list of the flora of that section should fail of proper notice of the Laurel and the Rhododendron. To lovers of flowers who only know the Rhododendron as a much-cherished little bush growing in some conservatory, or displayed as a treasure in some public or private park; and the Kalmia only under the same conditions, or as an occasional shrub in the woods, a few days in the southern mountains about the middle of June, would be a royal treat. Of the Kalmias I have seen but two varieties, though I think there is a third which I have not seen to know. Of the two the more abundant is *K. latifolia*. The mountain people invariably call it "Ivy," and give the name of Laurel to the Rhododendron. It dots the meadows and the woodlands with flecks of white. It borders the streams, often like a great white wall. Upon the hillsides it often grows in masses which at a little distance, look like banks of snow. It often forms dense thickets of vast area, and individual growths not infrequently attain the size of trees. I have seen it with a height of more than twenty feet and a trunk diameter of over ten inches.

Of the Rhododendrons I found eight—four classed as Azaleas, and four as Rhododendrons proper. The first of the group to come is the *R. calendulaceum.* It may well be doubted if, outside the tropics, there be a more gorgeous floral display than that presented by a giant bush of Flame-colored Azalea. The blossoms shade through all gradations of red and yellow, from the deepest crimson to the palest buff. In tramping the hills during May and early June, one easily gets the impression of an endless number of smokeless camp-fires. Sometimes the blaze is small and near the ground. Sometimes it shoots up into a great fiery mass of twelve or fifteen feet in height, and almost as much in diameter. Flame-colored is the fitting name for *R. calendulaceum.* Late in May or early in June, high up on the mountain tops, comes the pink-purple *R Catawbiense.* Here and there a bush may be found on the valley-levels. But its home is the mountain-tops, and them it robes in marvellous beauty. At about the same time there blossoms, in certain localities, a small white Rhododendron, not given in my copy of Gray. Nor does Gray give the R. *punctatum* which bears, in size and color, the same relation to R. *Catawbiense* that the small white one bears to R. *maximum*, the rival of *Catawbiense.* In its growth the *maximum* is the grandest of them all. I have seen it reaching a height of thirty feet and over, with a trunk of tree-like proportions. But those who have decided which of the two—the *Catawbiense* or the *maximum*, bears the more beautiful blossoms, have succeeded in a direction in which, as yet, I have failed. But, for me, like the wine at Cana, the best is reserved until the last. The season of Rhododendrons closes with my favorite. Along the banks of the larger streams there grows the pure-white, bell-shaped Azalea. Its exquisite purity of color; its delicate grace of structure; and its rich, though dainty fragrance, make it for me the flower of flowers—a flower for saints—a flower to serve equally well for a bridal-wreath or a burial-cross.

All these, and many more, are bits of life and color and fragrance which deck the valleys and clothe the hillsides of the most beautiful region in the United States—the mountains of western North Carolina.

THE STUDY OF THE ALGÆ.

By Josephine E. Tilden.

THE group of algæ include the oldest, the lowest, the smallest, and the most widely distributed forms of plant life, and yet, contrary to what might be expected, they are perhaps the least understood and the most generally unnoticed of any portion of the vegetable kingdom.

The unicellular algæ form the main trunk from which at different points spring the fungi, the red sea-weeds and the flowering plants. Each of these branches becomes specialized along certain lines, each group attaining great perfection in some characters at the expense of others, so that there comes to be the widest difference in the higher forms, as may be seen by comparing pod-scum with the toad-stool and the rose. The relationships of the different groups have been traced only by painstaking and long-continued study by many investigators.

The varied habitation of these plants is most interesting. They may be said to be almost omnipresent, for they comprise not only fresh-water and marine, but also ærial and subterranean forms. They flourish abundantly in the tropics and at the same time are the last form of vegetation met with in the Arctic seas and give rise to the phenomenon of "red snow" in Alpine regions. As fossils they are present in different strata far below the surface of the earth and they live at a greater depth in the ocean than any other form of plant life. At the same time they exist in immense quantities in the atmosphere, but are only conspicuous in the form of "dust showers" and "blood rain." They thrive with equal vigor in the frozen oceans of the North and the boiling waters of geysers. They seem able to endure everything with the one exception of dryness.

In size the algæ range from forms that can be seen only with the highest powers of the microscope to gigantic sea-weeds of Antarctic regions extending several hundred feet in length. The fresh-water algæ seldom do more than to form a coating or fringe upon wet rocks or a scum on the surface of water, thus making themselves to a casual observer an inconspicuous part of the landscape. But to the initiated they so increase in apparent importance that mountains and rivers sink into insignificance as the botanist wades into a muddy pool to capture a bit of green substance which dangles from a dead leaf and he thinks may be "something new."

When once the attention has been called to it one is impressed with the abundance of algal life everywhere. The green color noticed on damp sidewalks and walls is due to the presence of a one-celled alga called Protococcus. The same plant occurs on flower-pots in hot-houses. The rocks in the stone quarries which are kept wet by the spray of water-falls are covered with tufts of Cladophora, which is also attached to the larger pebbles in running streams. Pond-scum floats on the surface of sluggish waters. Vaucheria or "green felt" forms a velvet-like layer on wet ground. Diatoms, though individually microscopic, by gradual accumulation on the surfaces of dripping rocks form a quite noticeable brownish coating. In pure waters — and therefore in most cold springs — Draparnaudia is found. On the other hand, poisonous forms, such as Nostocs and Gloeotrichias, are inhabitants of sluggish waters — for the most part those that are in communication with stagnant marshes. Some algæ are parasitic, dwelling within the tissues of succulent plants. An odd place of habitation is the human mouth, for a lively little organism of the algal tribe lives on the teeth and is the direct cause of their decay.

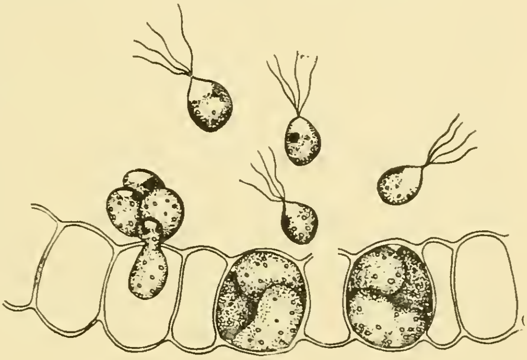
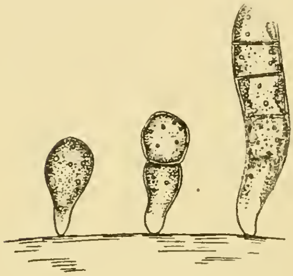


FIG. 1.

The life history of one plant may be described, and will serve as an example of the rest. Attached to the sides of wooden troughs, which are used to conduct cold spring waters, one often finds a minute, delicate fringe of green filaments which upon examination under the microscope is found to be a form known as *Ulothrix zonata*. The vegetative portion consists of a row of cylindrical cells each about as long as broad. The protoplasm with the chlorophyll granules is evenly distributed throughout the cell, giving it a uniform green color. The surrounding wall is delicate and colorless. This filament comprises the young plant. After it has become mature, the cells begin to swell, while the contents divide into spherical or somewhat elongated bodies. In certain cells these rounded masses are four in number (*Fig. 1*), and as they enlarge they press upon each other, giving much the same appearance as if four unbaked loaves of bread should be squeezed into a glass cylinder. If at this stage one of these cells be observed sometime during the early forenoon, the wall of the cell will be seen to burst and the four bodies pass slowly out. After pausing an instant as if to get their bearings they suddenly dart off in different directions with a motion very much like that of a spinning top. During this stage it is useless to try to observe them, but if they be killed by putting a drop of iodine under the coverglass and afterwards stained, it will be seen that they are egg-shaped green bodies with the smaller end colorless. This end bears four delicate cilia. Their motion was due to the lashing of the cilia in the water. If these spores had been left in their natural element, they would have continued their motion for perhaps half an hour and then happening to come in contact with a bit of dead leaf or a pebble in the water, would have gradually stopped their motion, withdrawn their cilia, and begun to divide up into more cells (*Fig. 2*) thus forming a plant like the one from which they were developed.



EIG. 2.

In certain other cells (*Fig. 3*), the protoplasm is divided into a larger number of smaller bodies with a thin membrane enclosing them. This sac of spores passes through a break in the wall of the cell and then liberates its contents, which acquire two cilia each and become active in the same way as the preceding ones. But before these settle down they fuse in pairs and then give rise to the filament of cells as in the other case. After once observing this phenomenon it is impossible for one not to feel that plants are as much alive as himself.

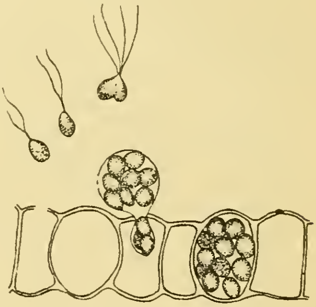


FIG. 3.

THE EVENING LYCHNIS.

By C. F. Saunders.

THERE are often to be found in the neighborhood of seaports, old ballast grounds, where vessels discharge dirt or sand taken aboard in some other part of the world. This dirt naturally contains the seeds or roots of many plants, some of which, taking kindly to their new surroundings, spring up and make themselves permanently at home on these western shores. Such ballast grounds, when allowed to lie undisturbed, are places of great interest to botanical collectors, who often find them to be veritable wild gardens of foreign plants—all doubtless common enough in the old world, and some of them common enough here, but others of them possessing for the American stay-at-home the charm of absolute novelty.

In the neighborhood of Philadelphia are several of these ballast lots, one of which the writer visited for a couple of hours one afternoon last October. At that frosty season, most of the flowers had already gone into winter quarters, but amid the tangle of sweet melilot, hedge mustard and mugwort, which made extensive thickets over the ground, my attention was attracted by the appearance here and there of the sprawling, forking stems of a plant strange to me, but marked with the characteristic swollen joints of the pink family. It bore stout, urn-shaped seed-vessels, brown, hard and shiny when the enveloping calyx had dropped from them, five-pointed about the rim of the open mouth and each point two-toothed; within was an abundance of ripe seeds, curiously pitted. Some pods, not so old, were wrapped in a sticky green calyx beautifully ribbed in green or purple; but diligent search through the tangle failed to several more than a few blossoms. These were salver-formed, delicately set atop of the long calyx tube, with five pure white petals, each notched at the apex and appendaged at the base so as to form in the center of the corolla a pretty little crown, or corona. This was about three p. m.

Leaving the spot for a while and returning to it about half past four, when the sun was nearing its setting, and the mists of evening were rising, I was bewildered to find the unkempt waste transformed into a very bower of beauty by the presence of hundreds of these starry white flowers gleaming everywhere low-down amid the grass and tangled stalks of the larger growth, and exhaling a faint but delicious perfume. What had happened to the desert place in my absence that it should have blossomed thus suddenly as the rose, was this: The plant was the White Campion or Evening Lychnis (*L. Vespertina*)—abounding in English fields and hedge rows, but not native to America, where it is found wild only about such waste places as that ballast heap. It is a night-bloomer, its flowers expanding at the approach of darkness, and remaining open through the night to wither in the morning. They were consequently (with an occasional exception) hidden in bed at the time of my arrival on the ground, but the advent of evening had, as though by the wave of a magician's wand, brought them quickly out while my back was turned.

Philadelphia.

Bulletin No. 6 of the N. C. Geological Survey, on the Timber Trees and Forests of North Carolina, by Gifford Pinchot and W. W. Ashe, is a valuable contribution. It consists of 227 pages and 23 full page plates of the more important trees, and contains much information as to distribution, abundance, etc. It may be obtained by application to the State Geologist, Chapel Hill, N. C., on payment of the postage (10 cents).

A PLEA FOR PRESERVATION.

By Harriet Wheeler.

THE following notice, placed by Senator Hoar on his grounds at Asnebumskit, Mass., will meet the appreciation of every lover of nature:

NOTICE!
YOU ARE WELCOME.
BUILD NO FIRES.
BRING NO GUNS.
AND PULL UP NO FLOWERS BY THE ROOTS.

The scientific spirit and the love of the beautiful are seldom at variance. A well-known botanist with whom I once made some collecting tours never ruthlesslessly or unnessarily tore up a single plant, and sometimes, when in search of specimens, the great sheets of moss were pulled off the decayed logs in the deep forest, they were carefully put back in their natural position, gently patted down, and coaxingly bidden to grow again and continue to bless with their beauty the sight of bird or deer, or of man, if he chanced to penetrate to the unfrequented spot.

I have in my herbarium a magnificent specimen of *Aspidium aculeatum Braunii* gathered by a friend at Avalanche Pass in the Adirondacks. The large, strong fronds and the heavy tuft of roots show it to be an old, long established plant. Many years have gone to the making of its vigorous, robust growth. It is a perfect specimen and it makes an interesting page in the herbarium. With the pressed specimen was sent a fine, healthy, growing plant which I put in a corner of the lawn, where it feebly exists in its strange and unaccustomed surroundings—a starved, homesick fern that longs for mountain air, the drip of waterfall and a rocky foothold, and I never look at it without a touch of pity. I am sure if the plants had been left in their native soil they would be sending out luxuriant fronds and somebody who goes without a specimen of this elegant, plume-like fern might have rejoiced in the possession of one.

The same friend, going to a distant point in the mountains beyond my ability to climb, promised to bring to me the *Aspidium fragrans*, which had grown there abundantly in former years. But, alas, not a frond had been left within reach. There were some growing on the perpendicular wall of rock, tantalizingly beyond the reach of even the sure-footed guide. So I had to look to some other locality for my specimens of *Aspidium fragrans*.

. A few years ago a new station for *Lygodium palmatum* was found at Hunter, in the Catskill mountains, and so far as I am aware, it was the only known station in New York State. The "summer boarder" immediately became interested in the "climbing fern" and must have it, so that the poor *Lygodium* was in danger of extermination. The owner of the grounds, appreciating the desirability of preserving it in its strange home, forbade his family to reveal its hiding place and succeeded for a time in protecting and concealing it by placing bushes about it to screen it from public gaze. But his success was short-lived. I was told this year that not a trace of it is left. The vandals found it and wantonly put an end to the growth of *Lygodium palmatum* in New York State.

The scientific botanist must make thorough, complete study of rootstocks, but it is hardly necessary for the amateur and average botanist and collector to verify every point in a rare specimen, however desirable it may be There are so many common varieties, both of fern and flowering plant, that afford ample means for study, that it seems like wanton destruction to uproot the rarer ones unless some good, profitable, intelligent purpose is to be subserved.

It is not on the plea of scientific interest that the tender *Pellæa gracilis*, which you never find anywhere but on a limestone formation, is pulled up by the roots and brought home. I will tell you why that is done—simply because it is the easiest, quickest way to get it, with roots attached, and the delicate, fragile plant can be preserved longer in its freshness.

If it is counted a virtue to make a blade of grass grow where none ever grew before, it must, with equal force, be reckoned a crime to rob the earth of the graceful beauty of fern growth that comes slowly to its perfection, and is slow to recover possession when deprived of it.

If my plea shall help anyone to be a little more considerate this year in rambles through woods and meadows, and along the roadside, it will not have been made in vain, and if any of my friends see fit to furnish me with rootless specimens I shall not dare to complain.

Mr. Virginius H. Chase, of Wady Petra, Illinois, is desirous of obtaining herbarium specimens, including flowers, fruit and mature leaves of all forms of Choke Cherries growing between Kansas, Nebraska and Illinois. He wishes to trace the eastern limit of *Prunus demissa*.

BOTANIZING IN WESTERN WISCONSIN.

By L. H. Pammel.

THE region in western Wisconsin, about La Crosse, is one of considerable interest to the collector. A considerable number of boreal, as well as austral types, are represented. Some of the austral species nearly reach their northern limit, as *Morus rubra*, which I found last summer in the southern part of Houston County, Minnesota; according to Mr. Upham* is said to have been observed by J. S. Harris, of La Crescent.

Gymnocladus Canadense occurs on the Wisconsin side of the Mississippi below La Crosse and in the Root river bottoms in Houston County, Minnesota. Another austral type, *Melica mutica*, was found for the first time last summer along the shaded bluffs close to the Iowa line in Houston County. The most southern locality of *Larix Americana* known to me in Minnesota is Pine Creek, opposite La Crosse. The swamp is small in extent and is accompanied by the usual hydrophytic plants, *Habenaria psycodes*, *Cypripedium spectabile*, *Pogonia ophioglossoides*, *Calopogon pulchellus* and *Drosera rotundifolia*. Most interest, however, centers in the vegetation of the hills. La Crosse is situated on a sandy prairie, having an elevation of 640–660 feet above sea level. Here occur many plants of xerophytic character, as *Talinum teretifolium*, *Aristida tuberculosa*, *Monarda punctata*, *Polanisia graveolens*, *Anemone patens*, var., *Nuttalliana* (commonly called the Crocus), *Viola pedata*, *Anemone Caroliniana*, and in sandy woods *Lupinus perennis* *Quercus tinctoria* is a small shrub or a small tree. The hills lying back of the old flood plain of the Mississippi river rise to a height of 150 to 300 feet. The hills are largely made up of Potsdam sandstone with outcrops of a white sandstone near the base, the upper parts of the higher hills being covered with magnesium limestone. The hills are usually flattened or slightly rolling and inclined towards the valleys. The surface soil consists of fine vegetable mould with underlying argillaceous soil. The sunny sides of the hills are usually devoid of trees, though on north slopes a dense growth of trees occurs. The higher dry points of the hills are usually denuded excepting a few species of trees and shrubs. The characteristic grasses over these denuded hills are *Andropogon scoparius*, *Bouteloua racemosa*, *Stipa spartea*, *Poa compressa*, in places *Poa pratensis* frequent. On the sandy rocks may be found the boreal *Poa nemoralis*, which is, however, a rare species; *Campanula rotundifolia*,

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*UPHAM. FLORA OF MINNESOTA.

Arabis lyrata, *Phlox pilosa*, *Anemone patens* var., *Nuttalliana*, *Delphinium azureum*, *Viola pedata*, *Aster sericeus* are common plants everywhere over these denuded hills. *Betula papyracea*, *Juniperus Virginiana* and *Juniperus communis* mark especially the upper limestone region. *Pellæa atropurpurea* is common on the limestone rock. In the more shaded places *Aquilegia Canadensis* and *Dodecathon media* commonly occur. *Zygadenus elegans* occurs only on the limestone outcrops on the most elevated hill tops. Its zone is certainly a most characteristic one. These tops simulate prairie conditions. The wooded portions of the hills contain *Quercus tinctoria*, *Q. alba*, the latter usually at lower levels in connection with *Cary alba* Both also occur on the ridges. The moist sandy black soils contain fine trees of *Quercus rubra*. *Prunus Americana* is common and forms large thickets, as does *Pyrus coronaria* and *Physocarpus opulifolius*. Here, too, occurs *Ostyra Virginica*, which forms large groves. Perennial springs are numerous, and where these with their constant supply of water run down the narrow valleys, *Tilia Americana*, *Staphylea trifolia*, *Fraxinus viridis* abundantly occur intermixed with the *Quercus rubra*. There are great beds of beautiful Columbines (*Aquilegia Canadense*) overhanging the rocks. The *Cypripedium pubescens* is common in the woods, as are *Phlox divaricata*, *Asarum Canadense*, *Viola palmata* var., *cucullata* and *Sanguinaria Canadensis*. Of the ferns *Osmunda Claytonia*, *Pteris aquilina*, *Asplenium Felix-fœmina*, *Cystopteris fragilis* and *C. bulbifera*. These are the only species usually found in the woods of those hills except the rare *Pellæa gracilis*, which occurs on the moist sandstone rocks. This delicate *Pellæa* sometimes covers whole ledges. The *Phegopteris Dryopteris* and *P. polypodioides*, *Polypodium vulgare*, *Woodsia ilvensis* occur only on sandstone ledges in the vicinity of White Pine groves which are absent from the hills in the immediate vicinity of La Crosse. *Camptosorus rhizophyllus* occurs commonly on the limestone talus at the bases of hills. *Onoclea sensibilis*, *Osmunda regalis*, *O. cinnamonea* are common about the Tamarack swamp, seven miles north of La Crosse. The *Onoclea Struthiopteris* is common under the shade of *Acer saccharum* in rich woods.

THE RAIN TREE.

By Lida B Robertson.

AT Healing Springs, Ala., the waste water of the medicinal springs bubbles off into a brisk little creek, and Holly trees, bays and all swamp growth luxuriantly flourish on both sides of it. In our rambles there through swamp and over hillside, my attention was called to a very strange phenomenon, viz: Rain showers from trees in the swamp when there was not a cloud in the sky. For several falls the mysterious phenomenon has been observed, but none had been able to explain or discover the cause. In the beginning of November we chanced to pass under a tree and distinct splashes of water-drops fell upon us, and gazing upward it dripped into our faces. The ground underneath it was damp, and the dead concave leaves upon the ground, like cups, caught and held the water. Upon examination we perceived that it was a large Holly tree and its leaves literally perforated with holes. We sought out many other Holly trees and found the same peculiar conditions pervading all of them. The ground elsewhere was dry and hard, while beneath the Hollies it was soft and wet. The swamp growth of laurels and other bushes looked parched and withered from the long drought, while underneath the Hollies they were fresh and green. For days I plied questions to everyone about the mystery, and visited the trees half a dozen times a day—to find no cessation in the rain showers. We thought the sap oozed through the eaten holes in the leaves and dripped down, but upon close examination of the leaves we found the edges of these holes healed and dry, with no vestige of dampness upon them. I observed that the water-drops distinctively splashed the upper side of the leaves, and there was no watery-dampness whatever upon the under side as if the substance dripped from the leaf itself, nor was there any dampness upon the bark of the branches and twigs as indicative that the drops were emitted through the bark. Finally I hired a boy to carry a ladder into the woodland and climb high into one of the largest Hollies, but he declared that he saw nothing. I commanded him to break off a branch and throw it down to me. He did so, but there was no further clue to the mystery. I proceeded to climb up into the tree, determined to take a seat up there and watch until I obtained some clue. As soon as I got up among the branches, I perceived hundreds of bugs, the size of our common Candle-fly, ranged lazily, and perfectly still, in single and double file all along the wood of the twigs and branches. I at once fixed my gaze upon them, and in rapid succession I saw the little bugs spurt forth miniature rain-drops—one alone sent forth by actual count twenty-five drops in about a minute For this to me curious new bug, I coined the name of "fountain bug." [It is known scientifically as *Proconia undata.*—Ed.] Subsequently, I observed that the shower, or down-fall, was of greater abundance on murky, damp days than in clear, dry ones.

Mr. C. G. Pringle the well-known botanical collector, is collecting this season in Central Mexico. The first installment of his collection, embracing about seventy-five species, has just been sent in.

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ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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We desire to call the attention of readers of Plant World to the fiftieth anniversary meeting of the American Association for the Advancement of Science, the sessions of which open in Boston on August 22. Various affiliated botanical organizations will hold meetings during the same week, and the opportunity offered to all plant lovers to meet leading botanists of the country, and participate in numerous attractive excursions, and to visit the historic Gray Herbarium, its botanical gardens, and the Arnold Arboretum at Jamaica Plain, is one that should not be missed. Membership in the Botanical Club is open to all those interested in its objects, and the admission fee is nominal. We understand that a congress of fern lovers will be held at the same time, and it is probable that a large attendance will be attracted. The railroads will offer reduced rates to Boston during the period, and excursions to Cape Cod and the White Mountains will take place at the close of the week. The value of these large scientific gatherings, even to the student and investigator, depends less upon the papers presented than upon the opportunity for social intercourse and the interchange of experiences between members. The technical papers are usually published subsequently in more complete form than that in which they are delivered, and can therefore be read and studied to greater advantage in moments of comparative leisure. It is, however, impossible to keep in touch with fellow-workers in botany unless one is able occasionally to meet them personally, discuss current problems, and form new ties of friendship. It often happens that a member of the Association meets at these gatherings some person whom he has never before seen, but with whom he has corresponded on botanical matters for many years. The Board of Editors of this journal will have one, and probably several representatives at the meeting, and we hope such of our readers as may conclude to visit Boston at this time will not hesitate to introduce themselves. The headquarters of the PLANT WORLD will probably be at the Copley Square Hotel, which is the general headquarters of the Association, although the sessions of the latter will be held in the buildings of the Massachusetts Institute of Technology.

.... NOTES AND NEWS.....

"Chicory Growing as an Addition to the Resources of the American Farmer," is the subject of the last bulletin (No. 19) issued by the Division of Botany of the U. S. Department of Agriculture. It contains very full descriptions of the method of growing the plants for the thick fleshy roots. It is stated that some 20,000 tons of chicory are imported into the United States yearly, all of which could be profitably produced at home.

Orobanche minor, the common European broomrape, is more abundantly naturalized about Norfolk, Virginia, than elsewhere in the United States, growing at roadsides and in fields. While usually making red clover its unwilling host, this broomrape is also parasitic upon white clover, common vetch (*Vicia sativa*) and wild carrot. Even upon seedling plants of *Ranunculus bulbosus* Orobanche sometimes fastens itself.—*Thos. H. Kearney, Jr., U. S. Department of Agriculture, Washington, D. C.*

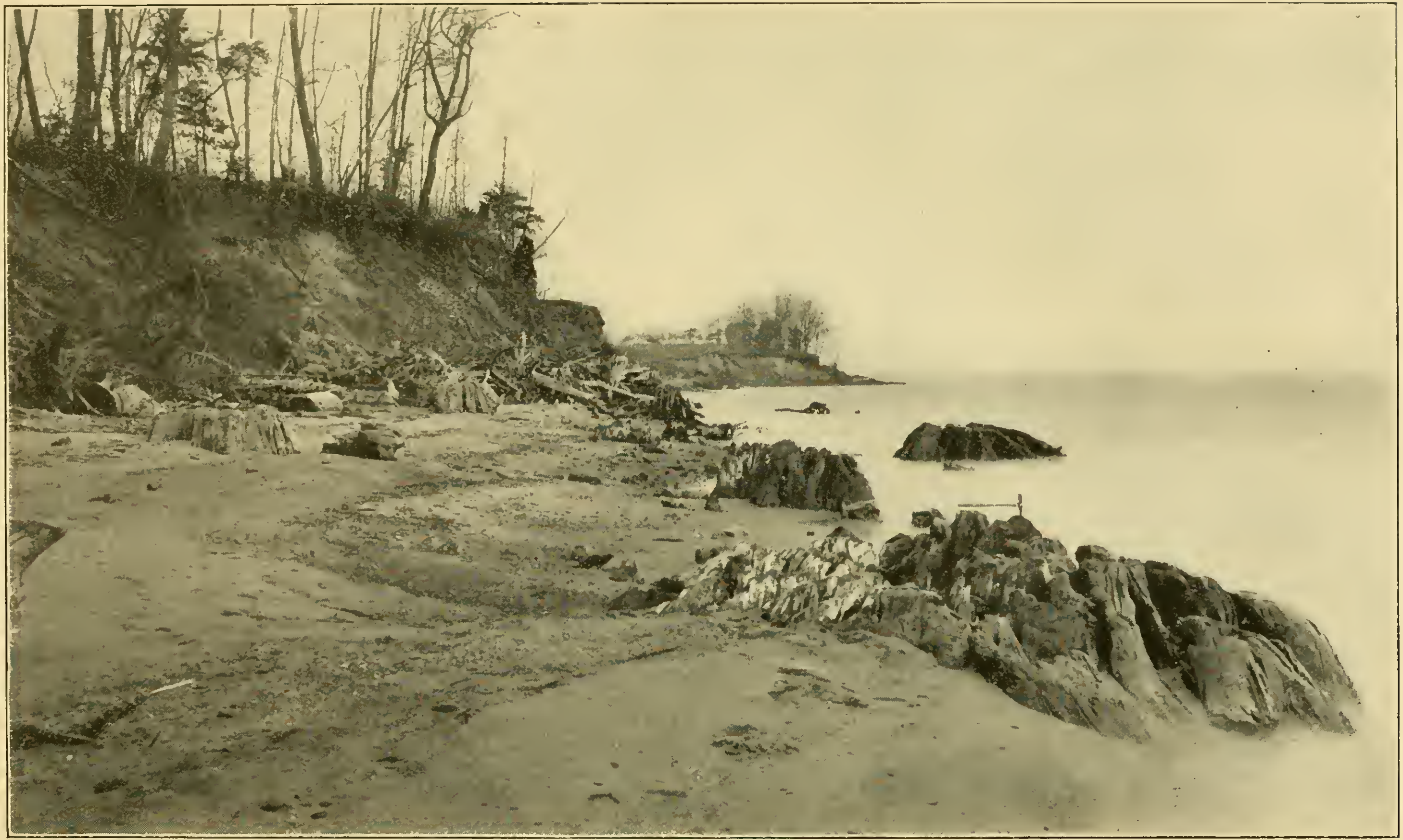
Messrs. F. Sander & Co. recently exhibited in London a remarkable plant discovered in New Guinea by M. Micholitz, who has christened his find *Acalypha Sanderi*. M. Micholitz was traveling in a remote district of New Guinea, inhabited by fierce cannibals, when he came across a beautiful flowering plant, which sprang up not only from the ground, but from the tops of the mud huts of the natives. He accompanied the consignment over 3,500 miles to Singapore, in order to see that the plants were safely dispatched from that port. The *Acalypha Sanderi* is a green-leaved species, with spikes of gorgeous crimson flowers hanging from every node. These beautiful floral spikes are from twenty to thirty inches long, and as thick as an ordinary walking stick. According to reports, a plant so striking in appearance has not been introduced to the civilized world since the *Victoria Regia* was transported from its Amazonian home. All the year round it sends forth its glowing pendants, and as its initial cost will be small, it is likely to be popular with those of modest purses who love the presence of floral beauties. The new plant belongs to the *euphorbiaceæ*.—*D. T. Pierce, New York City.*

If asked to name the herbaceous native plant of the Norfolk region which is at the same time most abundant and most conspicuous in the landscape, I should answer without hesitation, "*Senecio tomentosus.*" In almost every field where the soil is somewhat stiff and retentive of moisture, this showy composite displays its golden-yellow heads and clusters of root-leaves covered with dense white wool. The latter, even when the plant is not in flower, are conspicuous at a distance among the green of other herbage.—*Thos. H. Kearney, Jr., U. S. Department of Agriculture, Washington, D. C.*

In the May number of the PLANT WORLD Mr. V. H. Chase, of Wady Petra, Ill., reports the finding of *Carex xanthocarpa* Bicknell at that place in 1897. Its range may be extended west to South Central Iowa. It was collected at Peru, Iowa, in July, 1897, by Mr. D. E. Hollingsworth and was determined by R. I. Cratty and confirmed by Prof. L. H. Bailey. The specimens were distributed as No. 392, "Plants of Iowa," etc. On June 30, 1897, the writer collected a single fruiting specimen of the Hare's Ear Mustard (*Conringia perfoliata*) along the B., C. R. & N. Ry. at Little Rock, in Northwestern Iowa. This was, so far as known, the first report of its occurence in this state. Late in May of the present year Mr. Robert Combs found a group of these plants on the C. & N. W. Ry. at Ames. These specimens, which were still in flower, were collected by the writer and will be distributed later with the "Plants of Iowa."—*Carleton R. Ball, Ames, Iowa.*

Dr. W. H. Forwood, U. S. A., now stationed at the Soldier's Home, Washington, D. C., has presented his private collection to the National Herbarium. This collection, consisting of 950 sheets, was prepared by Dr. Forwood himself. It consists of two parts, the first containing plants of Western Wyoming collected in 1881 and 1882. These plants form the basis of two reports now rarely met with, published by the War Department. Many of the species represented are referred to in Frank Tweedy's Flora of the Yellowstone National Park. At this time Dr. Forwood discovered that rather pretty gentian, *Gentiana Forwoodii*, since frequently collected in the mountain meadows of the state, though not abundant. I observed only a few specimens when in that region in 1893. Many of the plants are accompanied by the autograph labels of either Dr. Asa Gray or Dr. Sereno Watson. The second part, consisting of species from the Black Hills region, chiefly from about Fort Meade, South Dakota. The specimens were all identified by Dr. Watson and are accompanied by his manuscript list. Dr. Watson wrote of the plants as follows: "It is a good collection, the specimens are good, several of the species have not before been found so far west, and four of them I consider to be new. I trust that you will not blame me for naming the majority after the discoverer." Mr. Rydberg, when he prepared his report on the Flora of the black Hills, was not aware that this interesting collection was within a mile of him or he would doubtless have referred to it. The plants, especially those from the Black Hills, are prepared with much care and are often accompanied by critical notes of value, which shows that Dr Forwood is a keen observer as well as a painstaking collector. Dr. Forwood's purpose in presenting his collection to the National Herbarium is that it may be more accessible to working botanists and receive better care than the migratory life of an army officer will permit. It is important to state that we have a full set of Dr. Forwood's types, among which are the following, named for him: *Astragalus Forwoodii*, *Artemisia Forwoodii*, *Aster Forwoodii*, and *Gentiana Forwoodii.—J. N. Rose, U. S. National Museum, Washington, D. C.*

In the spring, and especially in early spring, in the vicinity of Washington, it frequently happens that after a shower the edge of every pool of water in the streets and along the sidewalks will be bordered by a rim of pale yellow color. As the water evaporates this ring remains as a fine powdery mass, so much resembling sulphur as to have given rise to the popular name of sulphur showers. This so-called sulphur is, of course, not really sulphur, but when examined under the microscope, is found to be made up of a mass of the yellowish pollen grains of pine trees. Instead of consisting of a single cell, as do most pollen grains, this consists of three cells, the two larger end ones being filled with air and the other containing the ordinary fertilizing principle. The two air-containing cells are larger than the other and act like balloons to buoy it up in the air. In the pines and allied trees fertilization of the cones, by which they are enabled to set and develop seeds, is accomplished by the wind. That is, the pollen is produced in immense quantities and is transported through the air to the cones, which are often on separate, widely distant trees. It thus often happens that the pollen gets up in the higher currents of the air, is carried for long distances, and is only brought down to the earth by the rain, producing the so-called shower of sulphur. A shower of this kind occurred in Washington in March, 1886, and was sufficient in amount to be very noticeable. By careful investigation it was concluded that no pine trees could possibly be in flower at that particular season nearer than Alabama, Georgia and the Carolinas. It was recalled that the rain had been preceded by a strong wind from the south, which had borne the pollen for hundreds of miles and precipitated or deposited it during the rain storm.—*F. H. K.*



A FOSSIL CYPRESS SWAMP IN MARYLAND.

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THE VULGAR OR ENGLISH NAMES OF PLANTS.

By Valery Havard, M. D., Surgeon U. S. Army.

NOW that botanical nomenclature has at length obtained a reasonable measure of stability and uniformity, the time seems to have come to look over the much mixed and confused list of our vulgar or common English names and see to what extent they, too, can be brought under the operation of law, thereby securing in their use greater uniformity, simplicity and usefulness. It is a question which one can only approach tentatively and suggestively, since there is no natural or established rule which can surely guide us in the selection and formation of those names. We may say, in a general way, that the best English name is that which pleases the eye of the reader, is quickly and easily apprehended, and satisfies the mind by its fitness. But as the æsthetic sense, power of apprehension and sense of fitness are exceedingly variable quantities, we cannot have much hope of an immediate general agreement. However, it seems well to agitate and discuss this question so that botanists may become more or less familiar with its merits and gradually determine on what lines uniformity is to be attained.

We should bear in mind that English names are not principally intended for naturalists; to most botanists they are perhaps hardly anything better than a necessary evil which must be tolerated. They are chiefly intended for the large classes of intelligent people who take an interest in plants and love flowers, without the opportunity or desire for close scientific study. To such people, whose number is every day increasing, botanists have duties; they are bound to make their science as simple and attractive as possible, and, to that end, must begin by assigning or consecrating names which are readily intelligible to the ordinary mind. Inasmuch as there is one Latin binomial given to each plant, there should be likewise one authorized official English name; all other vulgar names should be regarded as synonyms and relegated to a secondary place.

It seems to me that in making and applying English names, we are to be guided chiefly by the requirements of correctness, fitness, brevity and simplicity. Long established usage must, of course, be a controlling factor, but should not stand an insurmountable obstacle in our way; thus Dog's-tooth Violet applied to *Erythronium*, Poison Oak to *Rhus radicans*, and Red Cedar to *Juniperus Virginiana* are so manifestly misleading in their incorrectness that they should be eliminated or reduced to a secondary rank. The law of priority which dominates scientific nomenclature plays here but a minor part, and is to be regarded only when it accords with the essential requirements above mentioned. It then follows that common names, to be acceptable and authoritative, cannot be left to individual judgment, but must have the approval of a majority of botanists. Probably the best result, if I may so suggest, would be obtained through the official action of a committee of the American Association for the Advancement of Science.

The binomial system imposes itself, as a general rule, in the application of English names; it is necessary that in most cases the genus name should be qualified by a specific adjective. One word is sometimes sufficient if entirely distinctive and free from all ambiguity, like Sassafras, Yupon, Ginseng, Catnip. On the other hand, we may have long compound descriptive designations like Jack-in-the-Pulpit, Lily-of-the-Valley, Man-of-the-Earth, which have a hold on the popular fancy and cannot be discarded. But such names are exceptional, and the great majority can and should be reduced to the binomial system.

It is hardly worth while to recall that English names, in their derivation, formation and meaning, bear no necessary relation to their Latin equivalents; many of the generic names, especially of trees, like Oak, Ash, Hickory, Sumach and Willow, have grown with the language and become part of it; in such cases all we need and can do is to apply the proper specific adjective.

It is an interesting question whether we could not follow more closely the method of Latin countries and translate more literally those generic names for which we have no distinctive equivalent; thus *Ranunculus* might very well become Ranuncule as in French, were it not that we have an equally distinct name in Buttercup; but such names as *Anemone*, *Hepatica*, *Cimicifuga*, *Cardamine*, *Polygala*, *Astragalus*, *Phaseolus*, *Campanula*, *Chenopodium*, *Polygonum*, *Euphorbia*, *Sporobolus*, *Epilobium*, &c., could doubtless be translated into Anemon, Hepatic, Cardamin, Polygaly, Astragal, Phaseol, Campanule, Chenopody, Polygony, Euphorb, Sporobol, Epilobe, &c., in the same manner that we already have Heliotrope, Sanicle, Agrimony, Brome, Rose, Pixie and Eryngo. Such names are certainly admissible and have the great advantage of being entirely free from ambiguity; they would be very attractive to many laymen who are confused and repelled by Latin terminations. To this may be objected that Latin names are about as easy to pronounce and remember as their English translation, that we already have many in current popular use, such as *Clematis*, *Chyrsanthemum*, *Lobelia*, *Aster*, *Oxalis*, *Rhododendron*, *Geranium*, *Phlox*, *Magnolia*, &c., and that more are steadily finding their way into English literature. Considering that so many of our genus names are awkward compounds, the propriety of vulgarizing more of the easier Latin names seems obvious; thus *Sonchus* seems preferable to Sowthistle, *Cicuta* to Water Hemlock, *Parnassia* to Grass of Parnassus, *Tephrosia* to Hoary Pea, *Rhamnus* to Buckthorn, *Hibiscus* to Rose Mallow, *Kalmia* to American Laurel, *Polemonium* to Greek Valerian, *Pentstemon* to Beardtongue, *Mimulus* to Monkeyflower. The only merit of these compound English designations is that they are somewhat descriptive of the affinities and qualities of the plants, but this is more than counterbalanced by the confusion they cause and the erroneous ideas they convey.

Regarding the specific name, if an acceptable one does not already exist, it is best, of course, to make it an equivalent of the Latin one, provided the latter expresses a correct fact and is sufficiently simple; for instance, *Lathyrus maritimus* naturally becomes Beach Vetchling, *L. palustris* Marsh Vetchling, *Acer rubrum* Red Maple, *Rhamnus lanceolata* Lanceleaf Buckthorn. Hard technical names, such as *oligocarpa*, *adsurgens*, *pentagyna*, *heterophylla*, are generally to be avoided; and so should geographical names, such as *Pennsylvanica*, *Canadensis*, *Illinoensis*, which too often convey a very confusing notion of the range of the plants concerned. Names of individual persons, like Watson Plum, Hooker Sandwort, Elliott Gentian, are unobjectionable and often desirable.

(*To be Concluded.*)

Dr. Walter Hough has just published a valuable contribution to the ethnobotany of the Moki Indians, under the title of "Environmental Interrelations in Arizona (*American Anthropologist* for May). He gives a carefully annotated list of 173 species of plants that are used either as food or in architecture, dress and adornment, domestic life, agriculture, medicine, religion and folk-lore. The scientific and native names of the plants are given in all cases. Dr. Hough remarks: "Curiously enough, every Moki [Indian] is a botanist; not a botanist, of course, in the scientific way: one for practical purposes rather, who had given descriptive names to his plants long before Linnæus had dressed them out in high-sounding Latin."

A FOSSIL CYPRESS SWAMP IN MARYLAND.*

By Arthur Bibbins.

ON the western shore of the Chesapeake, immediately south of Stony Point, or about one and a half miles south of Bodkin Point, a deposit of fossil Cypresses of large dimensions has lately been brought to notice. It lies at the base of the Raritan formation, at its contact with the recently defined Patapsco formation (both Lower Cretaceous), where it has been exposed to view by the action of the waves in wearing away the Bay cliffs.

The deposit is made up of more or less loosely bedded materials, including the prostrate trunks and limbs of Cypresses and other trees, imbedded in "moss," broken and charred twigs, etc., and of large Cypress stumps standing erect with their roots and knees in place.

The Cypresses are in a surprisingly perfect state of preservation as porous but tough brown lignite. A number of the stumps are at this date standing in place upon the beach, partly submerged, and fully exposed to the violence of the surf and the action of shore ice. Judging by their distance from the receding cliffs, we may suppose they have been resisting these corrosive agencies for a period of at least ten years, yet their present condition warrants the belief that they will persist for as many years to come.

This excellent state of preservation is certainly not accounted for by the great durability of Cypress wood itself, for it must be remembered that the age of the Lower Cretaceous deposits is reckoned in millions of years. An examination of the underlying and overlying materials suggests that the Cypress bed was originally sealed up in impervious envelopes of clay. At its base, penetrated by the roots and rootlets of the fossil trees, is a compact, greenish, sandy clay containing nodules of earthy carbonate of iron. The Cypress bed is overlain by a similar stratum of clay, and this by several feet of very fine soft blue clay. These overlying and underlying clays are seen to blend at the lower (southern) limit of the Cypress bed, so that before it was opened by wave action along its bayward margin the deposit may have been hermetically sealed.

The bed is now kept saturated by the water of the Bay, which, during extreme high tides or the prevalence of heavy surf, penetrates its porous materials to a considerable distance landward. The well-marked saline ingredients of the Bay water at this point rendering it congenial to barnacles, oysters, tunicates, crenophores and oceanic hydrozoa (Sertularia and Medusæ), may have aided to some extent in the preservation of the plant tissues.

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* Published by permission of the Maryland Geological Survey.

The basal greenish-colored clays of the deposit rest unconformably upon the deeply eroded surface of the iron-stained "fuller's-earth clay" of the Patapsco formation. The fine blue clay above mentioned as overlying the Cypress bed is conformably overlain by a bed of interstratified sands and clays, which is unconformably overlain by the Matawan formation.

The present extent of the deposit along the Bay shore is about one hundred and fifty yards. Its original bayward extent is of course unknown. One of the older residents alleges, however, that the cliffs have receded at this point at least two hundred feet within the last fifty years, when what appears to have been the bayward margin was worked to some extent for "marl." The landward extent is likewise unknown, but judging from the thickness now exposed, and from the fact that there are no noticeable signs of its thinning in this direction, we are permitted to suppose that the landward extent of the Cypress bed may be at least equal to its bayward extent.

The most striking feature of the deposit consists in the gigantic Cypress stumps standing *in situ* along the beach. Some of these are in the water several yards from the shore, where, when seen from a distance, their irregularly-worn surfaces resemble partly submerged rocks. Others are in process of erosion out of the base of the cliff. At this date there are thirty-two of these exposed, standing at various levels in the deposit. The roots of the lowest penetrate the basal greenish sandy clay, while their stumps in some cases extend up completely through the lignite bed proper. Other stumps stand at higher levels with their roots penetrating the swamp materials. They are all broken or worn off at various levels ranging from one to four feet.

The diameters of some of the more conspicuous stumps are as follows—the measurements having been made across their tops, where we may suppose the diameter is somewhat greater than that of the trunk proper: The largest stump exposed (see Frontispiece) measures a little more than ten feet. Its trunk probably reached eight or nine feet in diameter. Two others, measured higher up, are six feet; five are five feet; three, four feet; five, three feet; and three, two feet.

Knees, standing *in situ*, are abundant. The largest of these reach two feet in diameter. Their surfaces are much worn by the surf and exhibit some interesting natural sections which indicate their mode of development from the roots.

Only a single species of Cypress appears to be represented in the deposit, and this is apparently a near relative of—if not, indeed, identified with—our modern "Bald Cypress" (*Taxodium distichum*).

Near the base of the bed, associated with Cypress cones, a number of well-preserved Beech-nuts were found, some of them exhibiting worm-borings. They closely resemble the nuts of our living *Fagus ferruginea* Ait. Certain of the prostrate trunks are evidently dicotyledonous. It is not known, however, whether any of them are Beeches, no attempt having yet been made at careful generic and specific determinations of any of the remains found.

Unlike the subjacent Patapso formation, which, especially toward the Bodkin, abounds in fossil leaves as well as lignite,* the Raritan Cypress bed has not yet yielded determinable leaf impressions. Neither have any animal remains been found at this point. At "The Narrows," however, about one and a half miles southward, impressions of lamellibranch shells were found in a fine, soft, blue clay which at this date is believed to be homologous with the similar clays above mentioned as conformably overlying the Cypress beds.

The swamp deposit appears to represent an ancient land surface, submerged and buried in process of Raritan deposition.

Other beds, believed by the writer to be homologous, occur above the mouth of Stony Creek (south shore of the Patapsco); at Cape Sable (amber bed), Magothy River, in which a good leaf-bearing lens has recently been found; at Swan Bar (Round Bay), Severn River; at Burk's Shore, above Round Bay, where another rich leaf-bearing lens has lately been opened; and at Earleigh Heights (Speer's Sand Quarry), farther up the Severn.

The Woman's College Museum, Baltimore, Md.

TUNA AND ITS DISTRIBUTION.

By Dr. C. A. White.

WHILE cheerfully complying with the request that I should give some account of my observation of *Opuntia Tuna* in different countries, I wish to say that never having made any really scientific observation of that plant, what I herewith send is merely travelers' gossip. During my numerous journeys in Northern Mexico and the adjoining states of our own country, ranging from the Pacific to the Gulf coast, I had frequent opportunity to observe that great cactus and to note some of the uses to which it is applied.

In the regions referred to this *Opuntia* is usually called *tuña* by the inhabitants, that name being specially applied to its fruit. It grows spontaneously and abundantly not only over a great geographical area, but within a great vertical range above the level of the sea. I have seen it growing thriftily, but of comparatively small size, at not less than 5,000 feet above that level, but the most vigorous plants were found in the fertile valleys of slight elevation. In such positions plants not unfrequently reach a height of ten or twelve feet, and a diameter at the base of the stem of six or seven inches.

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* It should be noted that this lignite, which occurs in a blue potter's clay, bears abundant and exceptionally beautiful incrustations of bright pyrites of iron (parallel growths of octahedrons and cubes).

Compared with its abundant growth, little economic use is made of *tuña*. Its fig-like fruit is sometimes eaten, but it can hardly be said to be palatable human food, and, like other cactus fruits, it is decidedly laxative. If it were not for its armature of spines it would be more or less valuable as a forage plant, especially as it is always succulent, even during the dryest seasons. Still the "fronds" are sometimes soused in a small way after removing the spines. I once saw a ranchman preparing them by impaling them upon a pitchfork and holding them for a few seconds over a blazing brush fire. The spines, being dry, were quickly burned off, while the succulent "fronds" were hardly scorched. They were thrown immediately to the cattle, who ate them greedily and easily.

With the probable exception of the partial use of *tuña* in Central America as a habitat for the cochineal insect, its most important use seems to have been as a hedge plant. It is hardly comparable with the hedge plants of other countries, but it is apparently the best one in its native regions. The traveler not unfrequently sees the *tuña*, as well as other Opuntias, used by the natives to form their garden inclosures, and the early Jesuit missionaries often made effective hedges of it about their mission grounds. Portions of some of these ancient hedges are still growing, although the buildings they originally inclosed are in ruins. The vigorous growth of the plants has insured the perpetuity of those hedges, but it is evidently their armature of spines, rather than their resistant strength, that made them an effective barrier against both animal and human intruders, and that originally suggested their use for hedges.

In Southern Europe and the Orient *Opuntia tuna* grows with such wild spontaneity that only the historical fact informs the traveler that it is an acclimated American stranger. Indeed, by a large proportion of travelers and residents in those countries it is believed to be a native member of their flora. I found it growing with as great vigor at Jaffa and elsewhere on the Plain of Sharon, and at Jericho, on the Plain of the Jordan, as I had ever seen it in America. The former plain is only a little above sea level, but the latter is fully 1,200 feet below that level. I have thus personally observed this plant to have a vertical range of more than 6,000 feet, and a geographical range whose limits are nearly 160 degrees of longitude apart. It is an interesting fact that at both Jaffa and Jericho the inhabitants have used this great Opuntia for hedges, as did the missionaries of Mexico and California.

It is doubtless because of the thrifty spontaneity with which this Opuntia grows among the native plants of Southern Europe and the Orient, and the long time that has elapsed since its introduction there, that the popular belief that it is also native there is so general. This popular belief has found expression in various ways. For example, there have been published pictures of considerable artistic merit, representing biblical scenes and personages, in which the great Opuntia was introduced.

A friend of mine, also, who accompanied me on my journey to Palestine, and who believes that the leading structural feature of all Christ's parables and sayings was similitude, and not hyperbole, reached the conclusion that the thistle referred to in the saying, "Do men gather grapes of thorns or figs of thistles?" was really the Opuntia that grows now side by side with a thorny Cratægus there. The fruit of the Cratægus resembles grapes in size and shape, but they are not grapes; men do not gather grapes of thorns. The fruit of the Opuntia is fig-like, but they are not true figs; men do not gather figs of thistles. This pretty theory makes the similitude of the saying complete, but unfortunately Christ's audiences knew nothing of *Opuntia Tuna*.

Smithsonian Institution.

MUSHROOMS VERSUS TOADSTOOLS.

"The question which every one asks first is: How can you tell a mushroom from a toadstool? This is one of the questions which no one can answer. You cannot tell a mushroom from a toadstool because mushrooms are toadstools. The reason why the question is so frequently asked is because the belief is well-nigh universal in this country that the fleshy, umbrella-shaped fungi are divided into two classes—mushrooms which are edible, and toadstools which are poisonous. This assumed difference does not in fact exist. All the fleshy, umbrella-shaped fungi are toadstools, and to a small number of the best known edible forms the name mushroom is applied popularly and in commerce; but not a small number of the other toadstools are edible, and a great many of them, probably the most of them, are not poisonous."—*Dr. W. G. Farlow in the Yearbook of the Department of Agriculture for 1897.*

THE LIANA VEGETATION OF SOUTHEASTERN VIRGINIA.

By Thos. H. Kearney, Jr.

ONE of the most striking features of the flora of the coastal plain in the South Atlantic and Gulf States, is the wealth of woody climbers, which constitute what the Germans term the "liana formation." One need go no further than Norfolk to assure himself of this fact. In two very different situations are the lianas especially prominent—on the inner sand dunes of the coast, and in the fresh water, wooded swamps.

A number of such plants are common to both areas, but are usually strikingly different in habit in each. Thus the beautiful Yellow Jessamine (*Gelsemium*), with its shining dark green leaves and sulphur-yellow blossoms, deliciously scented with a distinctly heliotrope fragrance, covers the dunes with a tangled mass of stems, while in swamps it climbs tall trees and opens its flowers high above the ground. Poison Ivy (*Rhus radicans*) behaves in similar fashion. But, as a rule, the plants of dune and swamp are of different species.

The Trumpet Honeysuckle (*Lonicera sempervirens*) is most abundant upon the dunes, growing there with the Yellow Jessamine, but does not penetrate the deep swamps. Two grapes, the Muscadine (*Vitis rotundifolia*), and the Summer grape (*V. æstivalis*), are characteristic plants of the dunes, the former, especially, making almost impenetrable the thickets of Myrica that cover the sand hills. Still more effective as impediments travel to are the ubiquitous Greenbriars, notably *Smilax Bona-nox* and *S. glauca*. Less prominent, but still abundant, is the Virginia Creeper (*Parthenocissus quinquefolia*).

In the swamps the curious Supple Jack (*Berchemia*), not showy of blossom, but very handsome as to foliage and well worthy of cultivation, ascends the tallest trees, with stems sometimes as large as a man's arm. Among the tree tops the beautiful Cross-vine (*Bignonia crucigera*), our sole northern representative of a family to which belong many of the showiest of South American lianas, hangs out clusters of large, irregularly bell-shaped flowers, dull red without, yellow within, and faintly odorous of musk. The elegant *Decumaria barbara*, our only climber of the Saxifrage family, is an indweller of the deep, shady parts of the Great Dismal.

In more open places, where the sunlight may freely reach it, the delicate lilac-colored blossoms of *Clematis crispa* are often seen.

The Greenbriars of the swamps differ from their cousins of the dunes, *Smilax laurifolia* and the red-fruited *S. Walteri* being the species most characteristic of wet places. The former is a notable plant, with its thick, shining, laurel-like leaves and great heavy masses of stems weighing down the shrubs and trees upon which they support themselves.

It may be interesting, in conclusion, to group these various climbers in respect to their methods of ascending supporting objects. Decumaria and the Poison Ivy (*Rhus radicans*) climb by means of innumerable aerial roots sent out along their stems, and holding them close to the trunk ascended. Tendrils are the aid to climbing possessed by the Greenbriars (in which they are appendages of the leaf stalks), grapes (in which they are specialized branches from the leaf axils), Virginia Creeper (tendrils as in the grapes, but with the ends flattened out into holdfast disks), and Cross-vine (here the tendrils are branched and represent the terminal leaflet of the compound leaves). Yellow Jessamine and Supple Jack are twiners, ascending supports by means of the twisting of the whole stem. Often several stems twist closely about each other and form a great "braid."

United States Department of Agriculture, Washington, D. C.

AMONG COLORADO'S WILD FLOWERS.

By Charles L Hincke.

"Relics ye are of Eden's bowers,
As pure, as fragrant and as fair
As when ye crown'd the sunshine hours
Of happy wanderers there."
—*Keble.*

IT IS indeed with pleasure unalloyed that one spends his first years wandering among the hills and mountains, the valleys and the plains of Colorado; diversified as is the country, there is always something new, something beautiful to be seen and heard in these haunts of Nature; a new flower here, a sweet bird there, a busy band of emigrating ants yonder marching in single file to some new abode, a colony of saucy little prairie dogs basking in the warm sunshine, barking and scampering in every direction at the moment of your approach. But wonderfully beautiful and most full of interest are the wild flowers that are scattered in such rich profusion everywhere, in size, in fragrance and in variety.

From the very early springtime, through the glorious, long summer and until the ending of the late, late fall, they come, following one another in rapid succession, arrayed in their finest raiment, making the foothills and the prairie masses of color and of fragrance, until during June and July fields and pastures that have been kept free of cattle, are turned into veritable garden spots, rivaling many a labor-planted garden in the East. It is said that there are some two thousand varieties of wild flowers scattered among and adjacent to the mountains of the Rockies. It may well be possible, for within the small radius of a mile there have been found nearly two hundred kinds.

First of all to make its appearance upon the scene in the very early spring—on the sunny hillsides, beneath the pine trees—is the charming little Anemone or Windflower (*Pulsatilla hirsutissima*), coming even while the snow is yet on the ground; often it is seen surrounded by snow, pushing, as it were, its furry head up through the earth's white coverlet.

The beauty of the plant has not perished with the passing of the blossom, for where it has flourished there now appears the seed ball, waving its innumerable little fluffy hairs in every passing breeze. "H. H." speaks of these flowers most lovingly as "crocuses out in chinchilla fur," and that indeed is a most apt description; little tender things, protected in their furry garments, they are ready to face the snows of spring, and, unless covered up entirely, come forth rejoicing.

Then follows quickly the Yellow Pea, growing in patches of the brightest, freshest green and yellow; the little Moss Daisy, tiny blossoms of white bedded in masses of moss-like leaves; and soon at Eastertide the prairie is studded with countless blossoms of the Sand Lily—a name more fitting, considering the festival it honors, Star of Bethlehem (*Leucocrinum montanum*), is given it by the natives—an exquisite little lily-like flower with pure wax-like petals, and a delicious fragrance all its own. Even up among the hills it is found, but not so plentiful as in the valley below.

By the end of May, the fields are full of Lupine in varying shades of red; Pentstemons in blue and white, resembling the Hyacinths, so delicate and delightfully refreshing to the eye and nose; the Skullcap, with its purples. A charming little Bluebell now joins the rest, in color a deep, deep blue, as pretty and as quietly perfumed as one can wish, but this little beauty must be sought for, as it is chary of its charms and hides itself among the taller blossoms and shrubs; the Yellow Violet is met with at every step, the little nest of leaves filled with yellow blossoms, keeping company with the small, though spreading leaves and pretty blossoms of the Wild Mustard in delicate shades of yellow, white and pink.

Hardly a day now passes but what with its dawn a new flower may be found. The air is filled with sweet odors, the Pines and Spruces exhaling a fragrance that invites one to stay his steps and rest in the cooling shades beneath the wide-spreading branches, and to fill and refill his lungs with the life-giving air, never seeming to get enough. Long strands of Kinnickinnick (*Arctostaphylos uva-ursi*), the Indian tobacco, with its glossy, green leaves and bright, red berries, are found upon this soft, needle-cushioned ground.

The Beeflower (*Cleome*) grows in a perfect wilderness along the sides of the road, gowned in deep red, pink and white, great bushy heads of blossoms fringed with its long, slim, green seed-pods, raised on a slender stem high from the ground, with its leaves few and far between. The bees are ever busy about this plant extracting a sweetness that one would hardly think possible from a blossom whose fragrance is verily—vile. Pluck a flower and you are sure to throw it away immediately in disgust. A direct opposite to this blossom is the Wild Snowball (*Mirabilis*), lying in mats flat upon the ground in sandy and moist places, spreading its glossy leaves and balls of snow-white flowers to the day. It is at its best at early morn and in the evening, when its rich and penetrating fragrance fills the air. Its perfume is so overpowering that it is impossible to keep even a single blossom, beautiful as it is, within the room.

During the day a limp and withered flower that once was white may be noticed blushing into a pinkish color as if ashamed at being discovered in so sad a plight. Curiosity prompts us to take an earlier morning stroll, and we are thereby fully repaid, for behold! the limp blossom of yesterday is a charming flower of translucent purity to-day, and proves to be the Evening Primrose. Its delicate petals join together and then spread themselves to their fullest extent; from its center hang long stamens covered with golden pollen. The flowers vary in size from that of a half-dollar to one whose diameter is nearly six inches across, some of this size having been found in the Ute Pass and up the trail of Pike's Peak. The plant itself is small and the flowers hug the ground, blossoming only for a day, opening with the early dawn, when whole acres of it will, as it seems, suddenly burst into bloom, and during cloudy days remain so nearly the entire day, otherwise partially closing during the brightest and hottest hours of noon, but at the approach of evening once more unfolding its spotless beauty ere it closes and withers and assumes its robe of pink, blushing in its dying state, so that even in death it may retain some of its beauty.

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

ARTICLES AND NOTES ON ANY SUBJECT OF INTEREST TO PLANT-LOVERS ARE SOLICITED, AND SHOULD BE ADDRESSED TO THE EDITOR.

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THE Editor-in-Chief of this journal will spend three months in paleobotanical work in Washington, Oregon and California. During his absence the journal will be conducted by Mr. Charles Louis Pollard. All correspondence, including manuscript for publication, should be addressed to him at the U. S. National Museum, Washington, D. C.

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SOME time ago attention was directed in this journal to the fact that the forest reservations set aside by President Cleveland had been suspended by Congress for one year, and it was feared that the suspension might be made permanent. A determined effort was made along these lines, but the Sundry Civil bill, passed on June 30th, restored the original status and the reservations stand. It is a matter for congratulation that such is the case. Forests when once destroyed are restored with great difficulty, and every effort should be made to husband them.

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THE threatened extinction of some of our most interesting plants is a subject that should receive individual as well as public attention. The rapid disappearance of the fur-seal is a noteworthy instance, among animals, of a failure to take proper precautions in due season. Just as the fur-seal has been exposed to the attacks of Canadian poachers, many of our rarest orchids and ferns are falling a prey to the inveterate flower-gatherer. The Hartford fern (*Lygodium*) is sure to be exterminated in any locality that is not secluded or carefully guarded from observation. It is not so much the professional botanist who is at fault, but the inveterate desire of many persons to dig up and set out on their own grounds every rare or curious plant which they may discover. While a wild flower garden no doubt affords pleasure as well as profit, we distinctly disapprove of this practice when it results in despoiling our woods of their chief treasures. It should be the effort of everyone to leave the roots of any rarity intact, unless there is some scientific purpose in securing the whole plant.

.... NOTES AND NEWS.....

Dr. Edouard Strasburger, the distinguished German botanist, was recently elected a foreign member of the National Academy of Sciences.

Professor Lucien M. Underwood, of Columbia University, is spending the summer in Europe. He will look up certain American types in European collections.

Mr. Gifford Pinchot, the well-known forestry expert, has been made chief of the Division of Forestry in the U. S. Department of Agriculture, taking the position vacated by Dr. B. E. Fernow, who becomes the head of the New York School of Forestry.

The Department of Ethnology in the United States National Museum is very anxious to secure the identification of every plant used by North American Indians for any purpose whatever. Already Mr. F. V. Coville, Botanist of the Department of Agriculture, has made some contributions to literature of this kind, and they are of great value. Dr. Walter Hough of this Department has prepared a paper on the plants in use in the Southwest. Excellent work has also been done in this line by Dr. V. Havard, as published in the *Bulletin of the Torrey Botanical Club*. This inquiry would extend into the tribes noted by the early settlers of the United States. Plants are mentioned in the histories of that time, sometimes by their Indian names, sometimes by the common name of the day, but seldom by any botanical title that can now be recognized. In making a report upon plants for this purpose all that is necessary to say is that a certain plant, giving its botanical name, its English name and its Indian name, is employed by a given tribe for a definite purpose. For example, the following note has been handed in from California:

> ASCLEPIAS INCARNATA: Milk-weed. Indian name unknown. Used by the women of Round Valley Agency, California, for textile purposes.

Even this is incomplete, as it lacks two or three of the elements of information which would go to make up a perfect description. Any advice on these topics, from persons traveling over the country, will be very gratefully received by this Department.—*O. T. Mason, U. S. National Museum.*

Mr. F. V. Coville, Botanist of the Department of Agriculture, has left on a collecting trip to the Pacific coast. He will visit Oregon and Washington.

The Swiss society Rambertia has laid out an Alpine garden near Montreux, at an elevation of 6,000 feet, where the most beautiful trees and flowers of the country are to be cultivated.

While bicycling in Ontario last summer, I noticed by the roadside what appeared to be a very large dandelion. I secured the specimen and found it to be a dandelion in which what would normally be a floret was a head of florets, so that the large receptacle bore some twenty heads instead of florets, and each head was made up of ten or twelve florets.—*W. A. Bastedo.*

Upon a few of the old cypress trees that surround Lake Drummond, in the Dismal Swamp, and contribute largely to the rather weird aspect of the lake, cling small tufts of Hanging or Spanish Moss (*Tillandsia usneoides*). The stems do not exceed two feet in length, and give but a poor idea of this characteristic plant of our southern swamps.—*Thos. H. Kearney, Jr., U. S. Department of Agriculture, Washington, D. C.*

"Poison ivy (*Rhus radicans*) has long been regarded by the ignorant with a degree of awe akin to superstition. No one was able to tell how it produced its effects, and why it attacked some people and not others. Mysterious principles were relied upon to explain the phenomena, and up to the present time the common belief has been that the poisonous constituent was really an exhalation from the plant. In the latter part of the last century it was so regarded by the expert; then as our knowledge of plant chemistry advanced step by step, it was attributed more concretely to a specific gas, a volatile alkaloid, and a volatile acid like formic acid. More recently still, bacteria have been accused of causing the affection. Experiments have seemed to verify these ideas in turn, but the falsity of all has at last been proved by the discovery of a more tangible compound. In January, 1895, Dr. Franz Pfaff, of Harvard University, announced that the poison is in reality a non-volatile oil. Numerous experiments have been performed with the purified oil, and it has been shown to produce exactly the same effects as the plant itself. Dr. Pfaff has called this substance 'toxicodendrol.' It is found in all parts of the plant, even in the wood after drying. Like all oils, it is insoluble in water, and therefore cannot be washed from the skin with water alone. Alcohol dissolves it readily. Alkalies saponify it, and thus render it inert, but this result is more easily obtained by an alcoholic solution of the sugar of lead (lead acetate)."—*V. K. Chesnut in Year Book of the Department of Agriculture.*

An expedition under the direction of Mr. Borchgrevink is shortly to leave London for Australia and South Victoria Land, to explore the Antarctic regions. The party will sail in the ship *Southern Cross*, designed by the builder of Nansen's famous *Fram*, which has ten feet of solid oak at the bows. The sheathing is of American *greenheart wood*,* three inches in thickness and selected on account of its hard and slippery qualities. The expedition will sail from London in July, and its prime object is to explore South Victoria Land and the seas and islands between there and Australia.

One of my most interesting finds in the scrubby woods of the Long Island barrens was the curious little *Pogonia verticillata*. It is usually rare in any locality, but in one place, neighbored by the Kalmia, Gaultheria and Pyrola, it grew in great abundance, being in full bloom on the first of June. One must see this orchid growing before he has much chance of finding it for himself. The flowers are so inconspicuous and resemble so much the greens and browns of unfolding leaves, that the collector may be pardoned for overlooking it.—*Willard N. Clute, New York City.*

The common Asparagus, which is cultivated as an early spring vegetable, produces later in the season a tall, graceful nodding plume of dark green slender branches and leaves, with small yellowish-green flowers, that form the red berries later in the season, clinging after the leaves have fallen. Many an old-fashioned country parlor is decorated with them, but recently there has been introduced into cultivation a near relative, *Asparagus plumosus*, which is a vine, bearing slender compound branches at intervals on the stem. This species is very ornamental, and is being largely grown for decorative purposes, replacing the "smilax" (more correctly called Myrsiphyllum) of the florists, on account of being so much more delicate and graceful. It also has the great merit of keeping well, and will dry without losing its leaves or much of its color or shape, so that I have known sprays of it twined over the mantel-piece to last all winter and still be pretty in the spring. The species was introduced from South Africa in 1876. Many florists devote large greenhouses to its culture, and sell it by the yard for decorative purposes. A smaller-growing variety, known as *Asparagus tenuissimus*, is also used, while still another, *Asparagus Sprengelii*, recently introduced, makes a very pretty basket plant; the leaves are finely cut, and the plant does not climb like the preceding. There are about a dozen other varieties, but none of them are as desirable for florists' use as those mentioned.—*Elizabeth G. Britton, New York City.*

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*Do any of our readers know what American greenheart wood is?—[ED.]

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ORCHIDS ON LONG ISLAND.

By Augusta Schenck Kalbfleisch.

LONG ISLAND, although enjoying a reputation for ugliness and general barrenness, which I make bold to say is undeserved, merits, nevertheless, much attention in the eyes of the botanist, on account of its lavish display of wild flowers, including among its numerous varieties many which are mistaken by the non-botanist for rare specimens of hot-house culture.

Foremost among these are the orchids, species of which may be found during the summer, from May until October.

Probably the first to appear is the Pink Lady's Slipper or Moccasin Flower (*Cypripedium acaule*), a strikingly beautiful flower both in form and color, which grows on a scape from six to eighteen inches high, arising from two heavily veined, hirsute green leaves. The perianth is six-parted, the lip of a dull heliotrope pink (less robust specimens I have found almost white, while the strong ones are of a very deep hue). It is usually two or three inches in length, with the dark purple veinings prominent. The five sepals, waving and twisted, are dark brown in color, evenly streaked with a deeper shade of the same tone. This orchid generally abounds in dry oak woods, where it pushes through the dead leaves, unfolding its bud about May fifteenth. Some two weeks later in sheltered, marshy ground, appears the Arethusa (*Arethusa bulbosa*). I have found small clumps of these orchids, raising their heads like so many sentinels, beneath an almost bare bush of Poison Sumac, where I dared not reach for them. They are borne on a short stem, about eight inches in height, and upon it is closely pressed a linear leaf, which does not expand until after the flower has perished. The perianth is a bright magenta; the protruding lip, an inch or more long, is crested and fringed with yellow. This orchid always claims a certain interest, as only one other species of Arethusa is known, a native of Japan.

The next in season to appear is the fragrant Rose Pogonia (*Pogonia ophioglossoides*), which being rather a sociable flower, is found in quantities where it has once fairly become established. It is of a pale pink, its drooping lip bearded and crested with hues of white and yellow. The five sepals are almost equal and are regularly placed, fan-like, above the lip. There is always present a leafy bract which spreads over the capsule as the seed matures. The Pogonia grows singly, or in twos or threes, on a stem six to twelve inches in height, bearing one, two or three smooth, pale green ovate leaves.

If we search in the peat bogs or swamps during early June we are almost certain to discover this violet-scented little orchid, and often growing near it the Calopogon (*Limodorum tuberosum*). This latter orchid seems to enjoy quite an universal popularity, partly, doubtless, as it is rather more rare than some of our more beautiful species, and often difficult to procure even when its haunts are known. The stem, a foot or more in height, bears often eight to thirteen bright magenta flowers and one long, narrow, parallel-veined leaf. The flower is usually one inch long, the sepals and petals similar. The lip, erect and crested with many hairs of orange, yellow and white, is widely triangular at the apex, and the edges so revolute as seemingly to form a tube. The column is incurved between the two lateral petals. Each flower is subtended by a small bract.

In July we may search for the Habenarias (herbs with leafy stems and tuberous or fibrous roots), which present little or no difficulty of identification to the beginner if he has taken a careful survey of the admirable illustrations of Habenaria contained in Vol. I. of Britton and Brown's Flora. Their oddly shaped flowers are spicate and resemble a flock of so many tiny birds. The predominating colors among the genus are yellow, purple, white and green; the lip, generally spreading, is often cut into fantastic shapes and heavily fringed. These orchids, or at least those species common to Long Island, are found almost exclusively in bogs and moist ground.

The first to appear in early July, though by no means the most beautiful, is the Ragged Orchis (*Habenaria lacera*), which I have found growing in the water, but I must add that one is hardly repaid for the trouble consequent upon obtaining it, as it is very unobtrusive and "plain" in appearance. Its heavily fringed lip, as well as the sepals and petals, are of a pale green, but the flowers have no fragrance to make amends for their lack of beauty. *H. blephariglottis*, the White Fringed Orchis, is probably the most striking of the genus. This orchid is rather uncommon, and after a fruitless search through the wet, low grounds, we consider ourselves fortunate if we at last come upon a great expanse of these snow-white flowers in full bloom.

In July also appears the rival of *H. blephariglottis*, *H. ciliaris*, whose deep orange-colored flowers grow in an even denser spike than those of the White Fringed. These, too, thrive in very marshy ground—at Babylon, L. I., only a few feet from the shore of the Great South Bay. *H. grandiflora* and *H. psycodes* are found farther in land; they closely resemble one another, both being of a soft shade of lavender. The former, however, is much larger, the flower about three-fourths of an inch in length. The stems are stiff, bearing oval leaves, and the flowers are decidedly fragrant.

Before the Habenarias have faded entirely away, appear the small Grass-leaved Lady's-tresses (*Gyrostachys præcox*) These abound in meadows or grass, and the much twisted spikes of thick, waxy little flowers last often for several weeks.

In September and October follow the Hooded Lady's-tresses, *Gyrostachys Romanzoffiana* and *G. cernua*. Both are much stouter and larger in growth than *G. præcox*. The former, too, is very fragrant, growing in rather swampy ground. *G. cernua*, however, the Nodding Lady's-tresses, is found in abundance even in the salt meadows, but it is entirely devoid of fragrance.

The Lady's tresses are all white or greenish in color, the flowers borne in a spike, generally in three rows, which may be plainly seen by looking down at them from above. They are peculiarly thick and waxy; the tiny lip, the flower's most conspicuous part, is crisped and veined with lines of dark green, most pronounced in *G. cernua*. The sepals are usually coherent at the top. The stem varies from five to twelve inches in height, is bracted, and in some species the long leaf arising from its base has perished ere the flower arrives at maturity

I have made but a slight mention of some of our most familiar orchids; slight when I consider how much both of work and pleasure lies open to the student in this department of our botany, and not only to the student, but to the amateur flower lover as well, for among our native orchids are many which are calculated to excite our deepest admiration.

Orchids I think possess a subtler charm than any other class of flowers, and it is with the greatest pleasure that I have observed a rapidly increasing interest in and familiarity with them. So that soon, I hope, we shall see our Peramiums, Cypripediums, Orchises, and Habenarias, as universally known and appreciated as their cultivated sisters, the Lælias, Dendrobiums, Cattleyas and Odontoglossums.

Babylon, L. I.

THE VULGAR OR ENGLISH NAMES OF PLANTS.

By Valery Havard, M. D., Surgeon U. S. Army.

[CONCLUDED.]

AFTER these general remarks, let us now consider what should be the proper construction of English names. Our first endeavor must be to avoid all superfluities, to make our designations as short and concise as consistent with clearness, avoiding, so far as possible, the use of compounded words and hyphens; it is the surest way to render those names intelligible, acceptable and useful; thus, such appellatives as Thread-leaved Sundew, Alternate-leaved Cornel, Rough-fruited Cinquefoil, Triple-awned Grass, are too involved to effect a lodgment in the popular mind. The hyphen must disappear and the compound be reduced by elimination or a new combination.

As before stated, the genus name should be rendered by one word whenever practicable; for instance, we need not have Plane-tree, Orange-tree, Silverbell-tree, in which *tree* is so obviously unnecessary; nor Panic-grass, Millet-grass, Fescue-grass, Brome-grass, in which *grass* can be dispensed with. In the case of fruit trees, there is the possibility of confounding the plant with the fruit, but this is easily avoided by capitalizing the name of the plant; we may perhaps express a regret at having no other acceptable way to make the distinction, neither the different endings of the Latin and Spanish (Malus and Malum, Manzano and Manzana), nor the suffix of the French (Pomme and Pommier). Upon the whole, however, we find our language a sufficiently efficient instrument for our purpose, thanks to its flexibility and a certain power of agglutinative combination; it enables us to make many of the improvements we may deem desirable and which I shall now proceed to formulate.

1st. In case of all English binomials (or appellatives practically equivalent to binomials) clearly applying to well-known individual species and no others, as for instance in monotypic genera, the substantives should be capitalized and no hyphen used; thus, Skunk Cabbage, Witch Hazel, May Apple, Dutchman's Pipe, Poison Ivy, Oyster Plant, Cucumber Root, Cardinal Flower, Lily of the Valley, Balm of Gilead. This is what the eye and sense of fitness seem to require in this large class of names; since no qualifying specific adjective is ever used, no confusion need be expected. A justifiable exception, however, may be made in the few cases of short monosyllabic words like Blood Root and Sour Wood, which are often written Bloodroot and Sourwood.

2d. In genera in which two or more species must be designated and distinguished, and therefore the genus name qualified, other rules must govern:

a. Words denoting the entire plant, like herb, wort, weed, tree, grass, bush, as well as words denoting only a part of the plant, like flower, berry, nut, root, leaf, wood, should be affixed without hyphen; thus, Bladderwort, Peppergrass, Pitcherplant, Rosinweed, etc., and Coneflower, Basswood, Huckleberry, Cranberry, Waterleaf, Bladdernut.

b. Generic names consisting of two words not denoting the plant or any part of it, should also be compounded without hyphen. We have abundant authority for this in familiar precedents like Buttercup, Pennyroyal, Peppermint, Dandelion, Horseradish, Honeysuckle, which must have looked rather strange to our forefathers when first coined. In accordance with this rule we should also have Milkvetch, Goldthread, Sweetbrier, Sweetclover, Goldenrod, Hedgenettle, &c. The few exceptions will be in the case of words unusually long—that is containing two or more syllables, or when the name is made up of more than two words; in these exceptions the hyphen must be used, but only with one initial capital, thus: Prairie-clover, Sea-lavender, Forget-me-not.

c. In both classes A and B there are some names in which the terminal letter of the first word and the initial letter of the second, or suffix, are the same, as in Cat-tail, Bur-reed, Cancer-root, Arrow-wood; here the hyphen is required by the eye, and should be followed by a lower-case initial.

3d. Genus names in the possessive case, such as Solomon's-seal, St. John's-wort, are commonly written with the hyphen, followed by a lower-case initial, always with the exception of such names as apply only to individual species, like Dutchman's Pipe, Shepherd's Purse.

Plants named after individual men, like *Cratægus Douglasii*, *Pinus Coulteri*, *Solanum Torreyi*, may be regarded, in the English sense, as not strictly in the possessive case—that is, not denoting ownership; therefore, we may properly write Douglas Thorn, Coulter Pine, Torrey Nightshade, that is, a Thorn dedicated to Douglas, or a Pine commemorating Coulter, but not belonging to them, in the same manner that we write Washington City, Madison River, etc.

4th. Specific names must also be made as short and of as easy apprehension as possible. The method pursued in Sudworth's "Nomenclature of the Arborescent Flora of the United States" strikes me as being the correct one, and commends itself for imitation to all botanists. Superfluous qualifying words are eliminated, thus: Fringe Ash, Silky Cornel and Flame Azalea take the place of Fringeflowered Ash, Silky-leaved Cornel and Flame-colored Azalea. As to the troublesome and too common participial endings, such as heart-leaved, purple-flowered, rough-fruited, white-barked, big-coned, &c., the participle is changed into a substantive and added as a suffix without hyphen; we thus obtain such names as Heartleaf Willow, Smallfruit Hickory, Slenderstalk Sedge, Bigcone Pine, Purpleflower Raspberry, Whitebark Maple. Such names look somewhat unfamiliar, but are not at all confusing, nor against the genius of the language which tends to reduce involved participles to the more direct substantives, as in Shagbark Hickory, Beardtongue, Coneflower, Bunchberry, &c.; they are acceptable to the eye, quickly apprehended, easily remembered, and, therefore, destined, I believe, to become established in English nomenclature.

STUDIES AMONG OUR COMMON HEPATICÆ.

By Alexander W. Evans.

III. Lepidozia reptans (L.) Dumort.

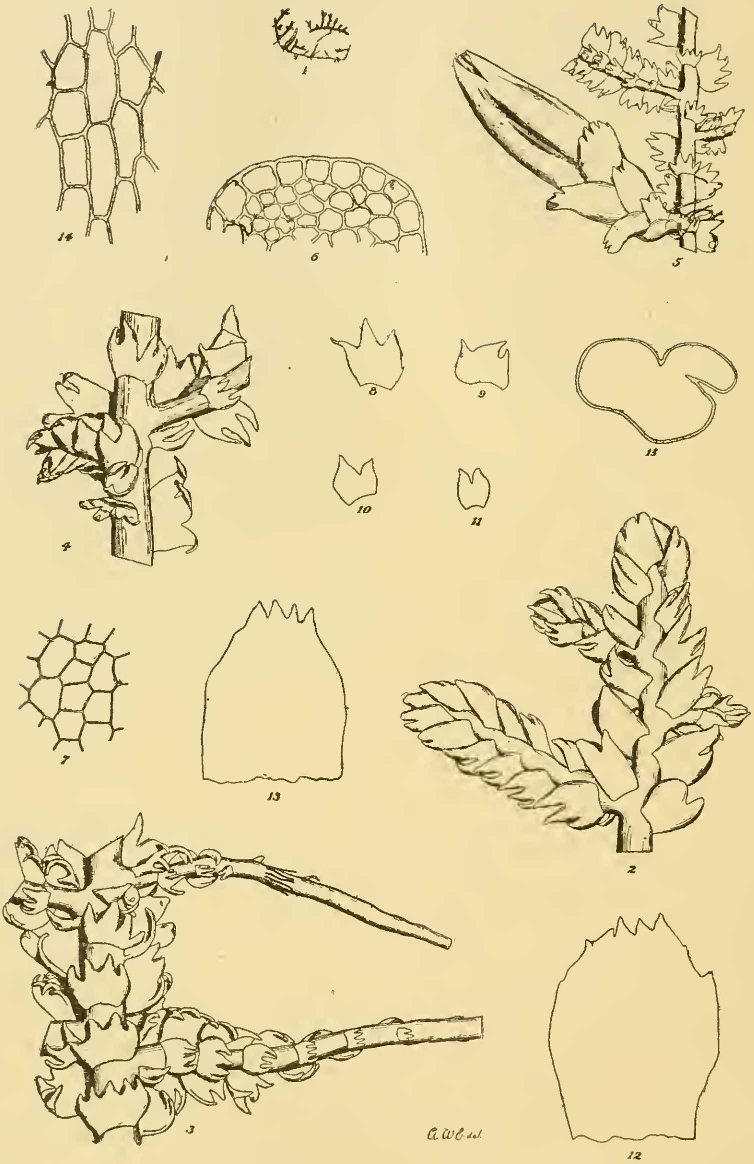
IN *Lepidozia reptans* again we have a species which is at once common and easily recognized. It is a plant of the damp woods and grows on rotten logs and on shaded banks and rocks in mountainous and hilly places throughout our northern regions and those of Europe and Asia. A peculiar habit of the plant is the way in which its prostrate stems creep over tufts of mosses and other hepatics; the tufts thus encroached upon are in time completely covered by the *Lepidozia*, and as their supply of light is cut off, they become feeble and finally perish. The prostrate stems are remarkable for their flattened appearance and for their regular, pinnate branching; as foothold is gained, they become crowded together and more irregularly branched, although even in this condition their tips remain flattened. It is among these crowded patches, and particularly those which grow on rotten logs, that we must look for fruiting specimens, the plants on shaded rocks being almost invariably feebly developed and sterile. Our species varies in color according to its exposure to the light; in deep woods it is very dark green but becomes pale green or whitish as the light grows more intense. Strong sunlight, however, is fatal to it, and where woods have been cleared away the plants first bleach out and then die.

The stems are much firmer in texture than those of *Lophocolea heterophylla* (which exhibits similar variations in color), and in a moistened tuft it is possible to seize one of them with the forceps and to draw it out without injury. They are long and slender, often attaining a length of 2 or $3^{cm.}$ and measuring with the leaves only $1^{mm.}$ in width. Upon cutting thin transverse sections, it is seen that the stems are built up of cells with slightly and uniformly thickened walls, those of the outer layer being somewhat larger than the others, but resembling them in most other respects.

The leaves are distant or loosely imbricated, and a marked difference in the manner of insertion will at once be noticed between these leaves and those of our two preceding types. In *Lepidozia* the leaves are still very obliquely inserted, but the line of attachment curves in such a way that the upper and not the lower margin of the leaf is turned toward the apex of the stem. When the leaves are crowded, this important difference becomes much more evident; for it will then be seen that the upper part of each leaf lies over the lower part of the *succeeding* leaf, and not of the *preceding* leaf, as was the case in *Jungermannia* and *Lophocolea*. The type of arrangement found in *Lepidozia* is called "incubous;" and as a result of it, the apical bud is turned toward the ground instead of away from it and is protected by older leaves which completely hide it from view. The two types of leaf-arrangement which we have studied are, in nearly every case, constant throughout genera and even larger divisions of the leafy hepaticæ. The leaves of our species are approximately quadrate in shape and broaden out very little from the base. Each leaf is cleft to about the middle into four obtuse or subacute lobes separated by subacute sinuses, and its margins are otherwise quite entire. On slender stems and branches the number of lobes is ofted reduced to three, a peculiarity which is especially frequent on rock-specimens. The cells of the leaves are polygonal in outline and increase slightly in size toward the base; all of them have thin and delicate walls without trigones.

Underleaves are everywhere present and are much more conspicuous than in either of our preceding types. They are about half the size of the leaves and are slightly wider than the stem. Like the leaves, they are divided almost or quite to the middle into four lobes, although on slender branches this number is reduced to three or even to two.

Attention has already been called to the regular, pinnate branching of the prostrate plants. The ordinary vegetative branches are all lateral outgrowths from the stem; each branch occupies the position and takes the place of the lower half of a stem-leaf, while the upper half of the same leaf persists as a bi-lobed structure borne partly on the stem and partly on the branch. The first leaf developed on a branch is an underleaf, which is somewhat pushed out of position and is only two- or three-lobed, even on robust branches; the succeeding leaves and underleaves are normal in their arrangement.



EXPLANATION OF FIGURES.

1—Plants, natural size. 2—Part of sterile stem, anterior view. 3—Part of sterile stem, posterior view, showing lateral flagella. 4—Part of fertile plant, posterior view, showing male branch. 5—Part of fertile plant, posterior view, showing female branch with perianth. 6—Transverse stem. 7—Cells from middle of leaf. 8-10—Perigonial bracts. 11—Bracteole. 12—Uppermost section of perichætial bract. 13—Corresponding bracteole. 14—Cells from middle of bract. 15—Transverse section of perianth. Figures 2-15 variously magnified.

All the figures are drawn from specimens collected by Miss Anna Murray Vail in the Catskill Mountains, New York.

On most stems and branches no rootlets, as a rule, are developed, although it is occasionally possible to find one or two of them at the base of an underleaf. The place of these important bodies is in part supplied by peculiarly modified branches known as "flagella;" they are much longer and slenderer than ordinary branches and their leaves are either rudimentary or absent altogether. The flagella are sometimes borne on the under surface of a stem just above an underleaf when they are leafless throughout; but in American specimens at any rate, it is more common to find them in the lateral position, where they start out as ordinary branches but sooner or later cease to develop leaves and acquire their characteristic appearance. On the flagella, rootlets are frequent and are found in clusters where leaves and underleaves would normally be situated. The flagella are of great importance for our plant and give it its power of creeping over tufts of mosses. They are so much firmer than the delicate rootlets that they are able to penetrate deeply into a tuft to hold the stem from which they spring firmly in position and to draw up moisture from below.

Lepidozia reptans is typically a monoicous species, although it is not unusual to find plants which bear archegonia only. The male and female organs, however, instead of being found on the same stem or branch as was the case in *Lophocolea heterophylla*, are developed on different branches. Unlike the vegetative branches, those which bear the sexual organs are borne on the under side of the stem just above an underleaf, in the position occasionally occupied by a flagellum. They occur singly, and their pale, bleached-out appearance will at once serve to distinguish them.

The antheridial branch is curved and small, being about twice the length of the stem-leaves, and it bears about half a dozen closely imbricated bracts, each of which encloses a single antheridium. The small bracts are very concave and are cleft about one-third into two or three subacute lobes, separated by narrow sinuses; their cells are very delicate in texture. The bracts are so closely crowded that it is often difficult to demonstrate the underleaves or "perigonial bracteoles." A careful dissection, however, will show that these structures are much smaller and more delicate than ordinary underleaves, that they are ovate in shape and are cleft about one-third into two subacute lobes.

The archegonial branch is much larger and more conspicuous than the one just described and bears a perianth 3 or 4$^{\text{mm.}}$ long and 1$^{\text{mm.}}$ in diameter. The branch is very fleshy and succulent in the lower part and gives off numerous rootlets which help hold it in place. It curves sharply about the stem from which it grows and brings the perianth into an ascending or upright position. The leaves on this branch (of which there are only three or four pairs) are practically all modified into bracts. Those at the base are very small, but they rapidly increase in size toward the perianth until the uppermost ones are often 1.5$^{\text{mm.}}$ long and 1$^{\text{mm.}}$ wide. These uppermost bracts are ovate in shape, very blunt at the apex and cut for a short distance into four to six small, sharp teeth; their margins are usually entire, but sometimes bear an indistinct tooth or two on the sides. The bracteoles also increase in size toward the perianth, and the uppermost is nearly as large as the corresponding bracts and scarcely different from them in shape. There is no adherence between bracts and bracteoles. Both of these structures are built up of cells much larger than the leaf-cells and with more thickened walls, the latter however, showing little or no indication of trigones.

The perianth is three-keeled in the upper part, but the keels, instead of being alternate with the bracts and bracteoles, are opposite them, and the perianth therefore presents a different type of structure from that found in *Lophocolea*. Assuming as before that this peculiar organ is built up of two side-leaves and an under-leaf, which retain their proper relative positions, it is clear that each of these leaves is folded lengthwise through the middle and that the keels of the perianth represent the folds of the leaves and not their united edges, as was the case in *Lophocolea*. These two types of structure are of considerable systematic importance, and are constant throughout large groups of genera. The type found in *Lophocolea*, which is perhaps the more primitive of the two, is called "epigonianthous," because the third keel is turned away from the ground; while that found in *Lepidozia* is called "hypogonianthous" because the third keel is turned toward the ground. In the accompanying figures, 1 represents the diagrammatic cross-section of an epigonianthous perianth, and 2, that of a hypogonianthous perianth. It may be added that the perianth of *Lepidozia* is slightly curved and fleshy, and that it is composed of two layers of large thick-walled cells throughout the greater part of its extent. At the mouth it is contracted and very minutely denticulate, the teeth being usually little more than slight projections from the marginal cells.

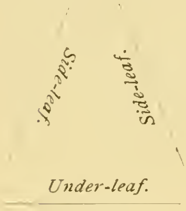


FIG. 1.

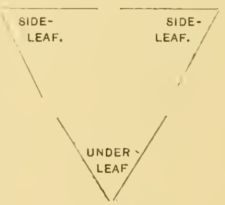


FIG. 2.

Yale University.

THE PLANT WORLD

A MONTHLY JOURNAL OF POPULAR BOTANY.

F. H. KNOWLTON, PH. D., EDITOR, U. S. NATIONAL MUSEUM, WASHINGTON, D. C.

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WITH the current issue this journal completes the first year of its existence. Arising not as the fruit of a hasty conception, but rather as the gradual outgrowth of a well-considered plan, it has consistently aimed to fulfil its mission satisfactorily. In comparison with other countries the United States has always been deficient in botanical journals of an essentially popular type; and within the last few years the development of interest in all phases of botanical study has been so marked that the absence of an adequate medium for the interchange of ideas had become deplorable. A year before the establishment of THE PLANT WORLD, a proposition was made to the Botanical Club of the American Association for the Advancement of Science that a committee be appointed to take into consideration the project of founding a journal which should become the informal organ of the Club. The suggestion did not, however, meet with approval, although it was admitted that the necessity for some such magazine was indeed strong. Those who had the project at heart, therefore, carried their idea into effect without aid from the Botanical Club; and the success of THE PLANT WORLD in the short period that has since elapsed is shown not only by our circulation, but by the list of contributors to our columns, which has embraced many prominent professionals as well as amateur botanists. An ample proof of the service performed by THE PLANT WORLD among plant lovers is to be found in the numerous letters of appreciation and encouragement received by the editors. It is not too much of an assumption to say that there is no other botanical journal in the country so entirely catholic in its scope, or one that offers a wider field for the interchange of non-technical information and experience. We do not desire to adapt THE PLANT WORLD exclusively to any body of students, but to make it bright, readable and interesting to every observer of plant life, whether teacher or student, amateur or professional.

.... NOTES AND NEWS.....

Mr. Charles L. Pollard, of the board of associate editors of this journal, is desirous of obtaining living as well as herbarium specimens of our native acaulescent violets. He is conducting experiments in cultivation with a view to determining the limits of doubtful species. All material thus offered will be placed in the collection of the United States National Museum. Mr. Pollard invites correspondence from those who are interested in the study of the group.

Prof. O. F. Cook, who has traveled extensively in the Canary Islands, says that the familiar prickly pear of the southwest, *Opuntia tuna*, is abundantly naturalized throughout the islands. The fruit is extensively eaten by the natives, and is also relished by domestic animals. It contains a red coloring matter. Another exotic Opuntia in the Canaries is *O. Ficus-Indica*, the fruit of which is also edible. This species was formerly largely cultivated as food for the cochineal insect, an industry which the introduction of aniline dyes has somewhat superseded.

The Report of the Missouri Botanical Garden for 1898 contains two papers by Mr. J. B. S. Norton. In the first of these, entitled "A Coloring Matter Found in Some Borraginaceæ," it is stated that in 1897 a small borage, which proved to be *Plagiobothrys Arizonicus*, was sent to the Garden from New Mexico, with the statement that the sheep feeding on it have their muzzles dyed of an intense red color. On further examination of the plant it proved to be alkannin, a dye produced by a number of borages, several of which are commented upon in the paper.—*Science.*

Those who are in search of interesting shrubs for cultivation should not miss *Amelanchier botryapium.* This and several other species of Amelanchier are known by the name of "shadbush," but the one mentioned seems to be superior to the others in every way. It is one of the earliest shrubs in blossom, producing large racemes of white flowers even before the leaves are developed. But beauty is not its only recommendation. The flowers are succeeded by berries as large, or larger than the finest blueberries. In reality they are miniature apples that when ripe are sweet, well-flavored and edible. The plant bears abundantly when but a foot or more high, and would seem to be an excellent addition to the gardener's list of fruits. In the wild state the plants differ much in the size of the berries borne, and it is probable that under cultivation much larger fruits could be produced.—*Willard N. Clute, New York City.*

This issue of THE PLANT WORLD unfortunately goes to press too early to permit us to include an account of the very successful meeting of the American Association for the Advancement of Science at Boston. We have been promised abstracts of several interesting papers delivered before the Botanical Section, and hope to publish several in the next issue.

Another instance of the eastward spread of western weeds may be seen in the case of Matricaria matricarioides. This is a close relative of the common Mayweed, and was recently found growing abundantly along a roadside at Fall River, Massachusetts. It is extremely common in the far Western states, but comparatively unknown in the East, although it occurs in several places within the range of the Illustrated Flora.

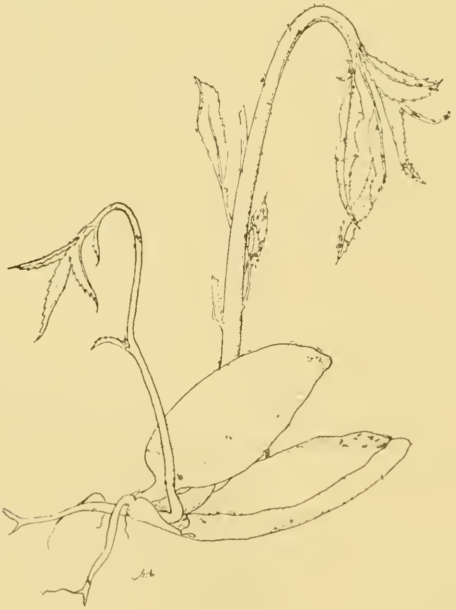
In the *Bulletin of the Torrey Botanical Club* for July, Mr. John H. Lovell writes of the fertilization of the Bunch berry (*Cornus Canadensis*) as follows: "Conspicuousness is gained by four parallel-veined involucral bracts. Parts of the flowers in fours, petals valvate, and one, or not rarely two, awned. As the flower-bud approaches maturity the filaments grow rapidly, breaking apart the petals at the base and protruding as four V-shaped arches. If at this stage the awl-shaped appendage is touched by the body of an insect or by a needle, the petals are instantly reflexed, the elastic filaments straighten, and a minute shower of pollen is projected upward. In fully matured flowers a faint snap may be heard. Self-fertilization is prevented by the immaturity of the stigma."

'One of the several interesting and instructive lines of work recently inaugurated by the Division of Botany of the U. S. Department of Agriculture is the investigation of the various uses made of native plants by different Indian tribes. Botanical specimens are first secured by the investigator in charge of the work, and these are then shown one by one to several of the older and more intelligent natives, who are generally found to be much interested in explaining the details of the use made of each specimen. For a small consideration they are also willing to part with samples of the crude products or the manufactured articles. A large stock of information is thus secured, and is supported by actual specimens. A large portion promises to be of much economic value. All statements are verified by cross-questioning and by the securing of several authorities for a single statement. Work on this line has thus far been officially prosecuted only in Oregon by Mr. F. V. Coville, and in California by Mr. V. K. Chesnut. The field for investigation is therefore still extensive.

A PEACH WITH A DOUBLE PLUMULE.

By E. J. Hill.

THE accompanying figure shows a seedling peach which was found in my garden. Although several leaves had appeared and both stems had begun to branch, they were so recent from the seed as still to be curved downward at the top. The two cotyledons were fresh and plump, and must have supplied all the nourishment of the plantlets, for rootlets were few and but just starting. One stem was $8^{\text{cm.}}$, the other $5^{\text{cm.}}$ high. A longitudinal section through the lowest part of the stems showed that the bud of the plumule had been a double one. Though the two stems were united at the side for a short distance from the base, the bundles of fibers in both ran separately to the same plane, and originated at the axis of growth of the root and caulicle. The smaller stem was not the development of a bud that sprang from the side of the larger, just above its base, but the division or branching took place earlier in the growth of the tissues.



. . . BOOK REVIEWS . . .

PLANT LIFE CONSIDERED WITH SPECIAL REFERENCE TO FORM AND FUNCTION. By Charles Reid Barnes, Professor of Plant Physiology in the University of Chicago. Henry Holt & Co., New York City.

This is a compact digest of the more elementary parts of the works of Sachs, Strasburger and other more recent writers on plant structure and physiology, very little in the way of new subject matter or figures being included. According to the author, "Plant Life" is an attempt—

1. To exhibit the variety and progressive complexity of the vegetative body.

2. To discuss the more important functions.

3. To explain the unity of place in both the structure and action of the reproductive organs.

4. Finally, to give an outline of the more striking ways in which plants adapt themselves to the world about them.

We are further informed that the book is expected to be of use to pupils thirteen to eighteen years of age enjoying good laboratory and teaching facilities. It will be found, we fear, that owing to the arrangement the first of the above tasks has been executed but too well, for the average pupil of the secondary schools will be well nigh certain to gain from the use of this treatise the idea that botany is a subject of endless and inextricable complexity. Why make it worse than it is by discarding a natural and rational for a much more complex and entirely artificial arrangement? Does Professor Barnes really believe that the student will be better able to understand or remember the phenomena connected with the life history of mosses on account of the distribution of facts and diagrams bearing on that subject in nine separate and distinct parts of the text-book? And is it not plain that the student's knowledge of mosses will be less? It is the general fault of text-books that they are constructed on the assumption that all students are beginning careers as specialists in the author's field of study, and the tendency to consume time and energy in laying a foundation of facts, definitions and distinctions of use and of interest only to the specialist is evidently as strong with the physiologist as with the systematist. Accordingly it may be suggested that the present work will probably find its greatest utility in supplementing rather than as furnishing an elementary course in botany. The large number of figures illustrating the generally concise definitions, together with a copious appendix of directions for laboratory work and physiological demonstrations, will also make it an indispensable assistant for all teachers of botany in primary and secondary schools.—*O. F. C.*

ILLUSTRATED FLORA OF THE NORTHEASTERN UNITED STATES. By Dr. N. L. Britton and Hon. Addison Brown. 3 vols. New York: Chas. Scribner's Sons.

We are in receipt of the third volume of the "Illustrated Flora," marking the completion of this important work, whose value to botanists of every grade becomes more and more evident with its continued use. The most conspicuous feature of this volume is the appendix, containing nearly one hundred species in addition to those described and figured in the text, the important characters being emphasized by the use of italics. This very helpful modification should have been employed throughout the book. The keys to orders and families, arranged as they are in systematic sequence, will be found useful as concise presentations of leading characters. For ultimate specific determinations the amateur student, at least, will turn to the illustrations, which in the volume before us show a marked improvement over those in the early portion of the work.

Some indication of the need of revision in which stood many of our large and difficult genera, like Aster and Solidago, may be seen in the circumstance that in the former genus alone (elaborated by Professor Burgess) there are described twelve new species and twenty-nine new varieties.

Not the least valuable feature of Dr. Britton's Flora is the index of popular plant names, prepared by Judge Brown and appended at the end of the volume; through this it becomes possible to discover to what species a given epithet has been applied, information often highly necessary in view of the extent to which certain descriptive names, like "snake-root" are used in different significations. The comparatively low price at which the "Illustrated Flora" is sold should result in the rapid exhaustion of the entire edition.—*C. L. P.*

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